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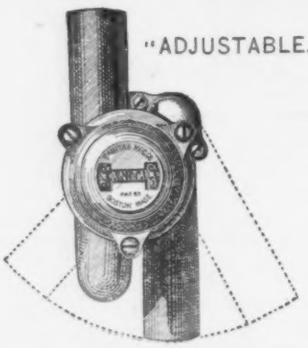
THE SANITAS TRAP.

"RIGHT HAND."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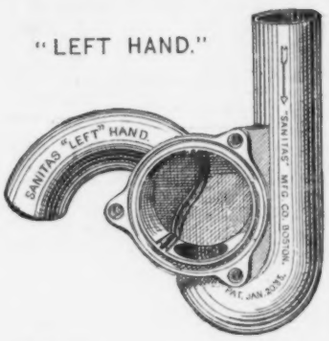

"LEFT HAND."

SOME FACTS AND SOME FANCIES
ABOUT THE SANITAS TRAP.

I. It is sometimes asserted that the seal of the Sanitas Trap can never be broken under any conditions. This is erroneous. Its seal can be pumped out by a force-pump, or by *Laboratory plumbing apparatus*, especially devised to destroy the seals of traps by siphonage. But the seal of the unvented Sanitas Trap *never can be and never has been destroyed by siphonage in good plumbing work.* Furthermore, the unvented Sanitas Trap will stand a severer test of siphoning action than will the vented S-trap. This has been demonstrated over and over again, and the demonstration can be repeated at any time to the satisfaction of any who are interested, provided care be taken to vent the S-trap in a manner *which is practical in plumbing*, using a vent-pipe of the size, length, and average number of bends found in ordinary practice. The seal of the Sanitas Trap will be *lowered* by severe siphoning action, *but it cannot be broken.* II. Again it is sometimes asserted that the Sanitas Trap cannot be clogged. This is also erroneous. The trap can be clogged by matches or kitchen refuse, if improperly used, just as can any ordinary waste-pipe; but when properly set and used the Sanitas Trap will never become clogged to the point of losing its effectiveness. If improperly used, as when under kitchen sinks the cook takes out the sink-strainer and sweeps into the trap bones and refuse never intended for the waste-pipe, the Sanitas Trap will be fouled; but it then *has the great advantage over all others of providing the easiest and safest means of removing this refuse matter*, and that with the aid of an ordinary screw-driver. When used under sinks the trap should be placed close to the sink outlet, and the sink strainer should never be removed. The grease will then pass through the trap in a liquid state and be caught in the suitable grease receptacle beyond. The efficiency of the Sanitas Trap will then remain intact indefinitely, while other traps, like the old-fashoned "D" trap, or its modern representatives, the "Bottle," "Round," and "Pot" traps, have bodies so much larger than their inlet and outlet arms, that they obviously cannot be scoured by the water when it passes through them. III. It is often thought that where special trap vent-pipes are called for, the Sanitas Trap is not needed. Precisely the opposite is the fact. All sanitarians now admit that whether the trap vent-pipe be used or not, *the trap itself should be anti-siphonic*, since the vent alone cannot always be relied upon. The mouth of the vent-pipe is often clogged, under sinks, by grease, since it is never scoured, and the friction due to its bends, and to the disproportion between its capacity and its length, often destroys its efficiency as an air supply. The Sanitas Trap is so constructed that its seal cannot be injured by evaporation produced by trap venting. Therefore, *where trap-vent pipes are called for the use of the Sanitas Trap is particularly necessary.* In virtue of the peculiar construction of the Sanitas Trap, *its outlet-pipe forms its own vent-pipe*, which is infinitely better than a special vent-pipe, inasmuch as it is always kept open by the scouring action of its own discharges. But even if it should ever become closed by grease, no harm could come in this case, since the same closure would not only shut off sewer-gas and siphonage, but also at once announce itself and be removed. IV. Finally, the seal of this trap can never be destroyed by *back-pressure*, in properly arranged plumbing. For with the main soil-pipe vented as it should be, no back-pressure can be generated strong enough to do mischief, where ordinary care and intelligence are used in originally laying out the work. For further explanations on this matter see the circulars and other publications of the

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MR. FRANK CUSHING, the young ethnologist who became by adoption a Zuñi Indian in order to study the habits and history of the sedentary or Pueblo tribes, is now engaged in an exploring expedition among the ruins of the great aboriginal settlements in Arizona. It has long been known that a certain river-valley, now a desert, was once filled with flourishing towns, and the curious remains of houses which occupied the terraces along the valley have attracted the attention of tourists, but no one, before Mr. Cushing, has had leisure to excavate among the ruins. Guided by his knowledge of the customs of the existing tribes from the same stock, Mr. Cushing's researches have been very fruitful, and he has found proofs of the occupation of the valley at a very remote period by a population of something like a quarter of a million. To support this population, the desert tract was irrigated by open canals, cut, in many places, in the rock, and extending over a length of about three hundred miles. A race rich enough and civilized enough to build three hundred miles of canals to irrigate its fields must have accumulated a considerable amount of portable property, and a great number of specimens of pottery, stone implements and skeletons have been found and sent East. Curiously enough, the excavations afford abundant evidence that the towns, instead of falling gradually into decay, were destroyed by a series of earthquakes. The walls have been thrown outward and the roofs, which were of concrete, supported on wooden beams, have fallen in, and in many cases the skeletons of the occupants have been found as they were struck down in the act of escaping. One skeleton in particular affords a curious glimpse of the circumstances of a catastrophe which, as Mr. Cushing thinks, took place before the building of the Pyramids of Egypt. It is that of a young girl, and was found surrounded by sacrificial offerings, close to an altar in a cave in the side of the mountain, which seems to have been used as a sacred place. We must presume that ethnologists keep their imaginations in subjection and reason from nothing but facts, but of these they seem to have discovered so many that the expedition is convinced that this Toltec Iphigenia, after several shocks of earthquake, was sacrificed as a supreme offering to the offended gods, and it thinks that on the return of the citizens to their homes after this appalling ceremony, another shock, more violent than any that preceded it, overwhelmed them, leaving, perhaps, none to tell the tale. It is a curious illustration of the almost indefinite persistence of tradition among ignorant races that, although this catastrophe must have occurred, apparently, about seven thousand years ago, the Indians of the neighborhood still speak with dread of the malicious spirits who dwell in the heights above the valley, and their fears gained from the whites the name of the Superstition Mountains for the range long before anything was known of the tragedy which had been enacted in their shadow.

A FEW weeks ago it was found that water was coming through the marble slabs which form the roof of the Girard College building in Philadelphia, and on looking for the cause it was found that the surface of the stone was somewhat seriously disintegrated, and that the corrosion had extended into the joints. The walls and columns showed no sign of being affected, and after consultation with a well-known Philadelphia architect, Mr. Windrim, who readily explained the phenomenon as being the result of the superficial decomposition of the marble by the sulphurous acid contained in the Philadelphia atmosphere, and brought to the roof by rain, the directors of the College decided to cover the stone with tin. Of course, the newspaper reporters seized upon the circumstance as a text for the most startling fancies. One of them announced that pieces of marble "an inch square" from the College roof "could be crushed between the fingers," and asked gravely whether the citizens of Philadelphia might not "awake some morning after a rain-storm to discover a mass of slaked lime in the middle of Penn Square," in place of the present City-hall, following up this lugubrious thought with the suggestion that it might some time "become necessary to erect a huge canopy of tin to house the Public Buildings." It is rather amusing to think of putting a tin canopy over a marble building to "protect" it, but apart from this, the way in which the Girard roof was affected is interesting. With most marbles, exposed as in this case for forty years, corrosion would have proceeded much farther, and it might have been necessary before now to replace the whole roof, but Dr. Walter was one of the best judges of building marble that ever lived, and the walls and colonnades of the structure are probably safe for ages. Whether it would be possible, with any marble, to make a flat roof which would withstand the acid rain of a great manufacturing city for forty years is extremely doubtful. The marble roof of Milan Cathedral must in places be five hundred years old, but most of it probably dates only from the beginning of the present century, and it is constantly under repair, while the atmosphere of Milan is far purer than that of Philadelphia. For some reason an exposed horizontal surface of stone deteriorates far more rapidly than a vertical, or even a somewhat inclined surface. In old graveyards, even in the pure air of the country, the top of a marble tomb-cover or horizontal tablet of any kind, which is more than a hundred years old, is generally powdery with decomposed carbonate of lime, and leaves white, chalky marks on the clothes or fingers, while the vertical surfaces, particularly if protected slightly by a projecting cornice, retain their polish indefinitely. Dr. Walter's opinion was that dolomite, or marble containing magnesia, like that found near New York, and in many other places, resists weathering far more efficiently than the pure limestone marbles, and he always used the dolomitic varieties in his own work.

AN EXTRAORDINARY exhibition took place a few days ago in Philadelphia, where the stockholders of the Keely Motor Company held a meeting, swallowed without a murmur the largest and most highly-flavored doses of impudence, to call it by no worse name, that have ever been offered to that long-suffering corporation, and finally adjourned, after voting to raise more money to go on with the "investigations" for which they have already contributed so much. If we recollect rightly, the last important stockholders' meeting was made joyful by the announcement that within a few weeks a locomotive, propelled by "sympathetic vibrations," would be running regularly on one of the Pennsylvania railroads, and that other machinery, employing the same motive power, would be put in operation as fast as it could be put together. Years have elapsed since then, but no sympathetic locomotive has ever yet moved on a railroad in Pennsylvania or elsewhere, nor has the vibratory force been utilized for any service which has brought income to the corporation; yet, instead of an apology for this trifling, the official communication from the great inventor to the stockholders who have maintained him so long in luxury for so many years is said to have contained the announcement that as the company "had not for years furnished him any money to carry on his experiments," he had resumed "the exclusive ownership of his inventions," and had "been obliged" to form a new association with these inventions as its basis, and "to issue and sell certificates of stock in the new company" in order to raise the money he wanted.

This astounding message to the official meeting of a corporation whose stockholders have expended two hundred and fifty thousand dollars on their great principal's patents and "experiments," seems to have attracted the attention of no one except the retiring President, who mildly remarked that he hoped that in all these new transactions "the interests of the present shareholders would be guarded," but did not mention how he would propose to guard them from a person who had, according to his own statement, appropriated all the interests they had, and sold them to some one else. A much greater sensation was excited when Mr. Keely's counsel read the other portion of the report, in which it was announced that after reaching the point of promising to drag locomotives around by sympathetic vibrations, and actually showing a coffee-mill at work, attached to a "vaporic generator," he was "baffled by a mechanical difficulty that was impossible for him to overcome," and had since then devoted his attention to the construction of a "sympathetic liberator," which will transmit an "uplifting expansive force" of twenty-five thousand pounds per square inch through a wire, and now occupies all his attention. In his own opinion the success of this "new departure" would be greater than the most sanguine of his adherents had anticipated, but, although he was expecting to receive in a few weeks some machinery which would go far toward perfecting his discovery, he "would not venture to predict how soon his work would be concluded." As a confirmation of this interesting statement, his counsel read a supplementary report, drawn up by himself at Mr. Keely's request, in which he expressed the opinion that the great inventor "had reached the sphere of perfect vibratory sympathy." This cheered the stockholders to such a degree that they immediately raised the appropriation for expenses, without waiting to inquire whether it was they or the shareholders of the other company that the great man proposed to be in "vibratory sympathy" with for the future, and then adjourned, to wait with patience for the appearance of the "sympathetic liberator" in the mechanical world.

A CURIOUS illustration of the truth of General Grant's maxim, that the best way to get a bad law changed was to enforce it rigidly, is furnished by a case now on trial in New York. Every one knows something of what is called the "contract labor law," by which American citizens are forbidden, under heavy penalties, to engage foreigners to come to this country to work for them, an exception being made only in cases where the imported laborers are experts in an art which has not previously been practised in the United States and which the citizens of that enlightened country will have an opportunity of learning from the new-comers. Apparently, the law had its origin in the desire of unthinking legislators to please some of their recently-naturalized constituents, who had a dull notion that they would be in some way the gainers by shutting the gates through which they had themselves entered and monopolizing the trade which they professed, but its principal effect has been to enable mischief-makers to annoy such manufacturers as might show enterprise or public spirit enough to wish to raise the standard of skill in their business or to defend themselves against Union tyranny. Within a short time it has occurred to some one that the law applies to laborers in other fields than that of manual toil, and that a considerable commotion might be caused by trying its virtues with regard to people belonging to trades in which it is not the fashion to surrender one's common-sense into other people's keeping. With this view, an attack has lately been made upon the Corporation of Trinity Church in New York. The Trinity wardens have, it seems, recently engaged as assistant in the church a young English clergyman, who has already entered upon his duties. Innocent as this transaction seems, it involves, as we now learn, and as, in fact, cannot be denied, a flagrant violation of the statute. If the wardens had wished to do their duty as good citizens, they should have gone to Castle Garden and watched for emigrants with white neckties, and when they saw one of prepossessing appearance, have accosted him, promising him suitable wages for his labor. They would then have been blameless, and, as fast as their new priests disappeared with such portable property as might be at hand, they could have engaged new ones until the supply of clerical emigrants was exhausted. This method of hiring, although perhaps not satisfactory at all points, is permitted by the law, but any attempt at getting persons of known character to come from foreign parts to render a definite service is clearly forbidden, and, unless the plea can be made that the cure of souls on Mr. Warren's plan is a new and useful industry, we do not see how the Trinity parish can escape a heavy fine. A still more interesting phase of the matter is, however, to be found in the glimpse which it gives us of the possibilities of the future unless the statute law is soon repealed or modified. As the law now stands, not only the English clergymen, who are tolerably numerous in this country, but the foreign opera-singers, dancers, actors and actresses, lecturers, pianists and other musicians, professors, teachers and artists, who come by invitation and promise of reward to instruct and delight us, are here in defiance of the laws of the United States, and must, according to those laws, be shipped back at once to their native country by the United States marshal, if he can catch them, while those persons who invited them to come here are subject to severe punishment. There is no difference between the cases of these persons and the Canadian ship-carpenters who were made to experience the rigor of the statute a year or two ago. Our native songsters and divines have just as much a right to protection against foreign competition as the Detroit boat-builders or the New England weavers, and the arrest and expulsion from the country of Colonel Mapleson's opera troupe, for example, with the exile to the Dry Tortugas of a few impresarios and church committees, would teach the bloated aristocrats of the country a lesson in regard to the claims of native and naturalized talent, which seems as yet to have been thoroughly learned only by the working-classes.

A CANVASS is being made of the colored population of the country for the purpose of raising funds for the erection of a monument to commemorate the part which the African race took in our Civil War. While it would be unfortunate to distinguish in general by the accident of ancestry among the patriotic citizens who took up arms in defence of what they considered to be their country, the position of the colored population in relation to the great struggle was a peculiar one. If they had not lived in one section, under conditions which were unknown in the other section, the war would have been impossible, and as one of the results of it was to change profoundly the condition and prospects of the race in America, there is certainly good reason for wishing to commemorate a series of events which changed four million slaves into freemen and citizens and called thousands of colored men to arms, to fight heroically for the cause which had become their own. To use a common simile, the four-years' war was to the negroes something what the Exodus from Egypt was to the Israelites, and, although the children of Israel, after the crossing of the Red Sea, had to wander forty years in the Wilderness before reaching the Promised Land, and it will probably be more than forty years from the date of the Emancipation proclamation before the colored people of the South acquire full recognition of their rights as citizens, nevertheless, the beginning of the pilgrimage is an event which should never be forgotten, and the Joshuas and Aarons of the movement, while the memory of them is fresh in the minds of their followers, ought to be honored with permanent memorials. The intention of the leaders of the movement is to raise, if possible, a million dollars, and erect with the money a monument at Washington which shall consist of a central design commemoratory of the part taken by the colored race in the war, surrounded by memorials of the individuals most distinguished in the emancipation movement. If properly managed, this scheme ought to be one of the most successful, from an artistic point of view, of those which the war has suggested. After the iron-foundries began keeping soldiers' monuments in stock, whatever sentiment had once attached to those structures evaporated, and it is a rare thing to be able to extract an idea from the compositions of granite obelisks and deformed lay-figures which occupy the most prominent positions in our larger towns, but the theme of the colored men's monument is full of suggestions. Fortunately, there is never likely to be more than one, so that the designer of it will not suffer the annoyance of seeing his ideas caricatured elsewhere, but with the strange, wild history of the Southern slaves in 1863–64 to inspire him, it would be strange if a man of decent abilities could not evolve a monument which should excite more attention, at least, than anything of the kind which now exists in Washington.

LANDSCAPE GARDENING.[1] — III.

AS it is difficult for the student of landscape-gardening to find teachers in the more artistic departments of his work, there is all the more reason why he should master the teachings of books. The literature of the art is not so large as might be expected, nor am I at all competent to draw up a catalogue which would show its actual extent. But even a partial list of prominent works may be useful, so great seems to be the ignorance of the public with regard to them. These, then, are a few of the books which may be studied:

MOREL — "*Théorie des jardins.*"
GIRARDIN — "*Composition des paysages.*"
HORACE WALPOLE — "*Essay on Gardening.*"
HIRSCHFELD — "*Théorie de l'art des jardins.*"
PRINCE DE LIGNE — "*Coup d'œil sur Belœil.*"
GILPIN — "*Forest Scenery;*" "*Practical Hints on Landscape-Gardening.*"
WHATELY — "*Observations on Modern Gardening.*"
WEIVERT — "*Die schoene Landbaukunst.*"
BAUMGARTNER — "*Idées pour la décoration des jardins.*"
SIEGEL — "*Description des jardins modernes.*"
REPTON — "*Theory and Practice of Landscape-Gardening*"; "*Fragments on Landscape-Gardening*"; "*Sketches and Hints on Landscape-Gardening.*"
CURTEN — "*Essai sur les jardins.*"
LOUDON — "*Treatise on Forming Country Residences.*"
UVEDALE PRICE — "*On the Picturesque*" (Edited by Sir J. Dick Lauder.)
THOUIN — "*Plans raisonnés des jardins.*"
LABORDE — "*Description des nouveaux jardins de France.*"
SEELEY — "*Description of Stowe.*"
MASON — "*Essay on Gardening.*"
LAUGIER — "*Essai sur l'architecture.*"
CHAMBERS — "*Dissertation on Oriental Gardening.*"

All these are books which date from the last century or from the first quarter of our own. It is needless to name works of earlier origin than these. They deal of course, with those more formal developments of the art which are infinitely beautiful when well managed in the right place and the study of which is essential to the cultivation of the student's mind and taste, but which from a practical point of view are less helpful to him than those later developments to which the word *landscapes* may more truthfully be applied. And besides, they are works of classic reputation which will be found in any catalogue that contains architectural treatises of the same period. Architecture and gardening were, in truth, so closely united in the seventeenth century that books which deal with the one art very often deal with the other too.

Between the year 1820 and times which may be called our own, few treatises upon the art seem to have been written. The best of all recent books — indeed, I think the most illuminative of all extant books — is the work of M. Edouard André already referred to — "*L'Art des jardins.*" A few others are:

ROBINSON — "*Parks and Gardens of Paris*": "*The Wild Garden.*"
VITET — "*Etudes sur l'histoire de l'art,*" Vol. IV.
CHOULOY — "*L'Art des jardins.*"
MEYER — "*Lehrbuch der schoenen Gartenkunst.*"
RUPRICH-ROBERT — "*La Flore Ornementale.*"
ANDRÉ — "*Un mois en Russie.*"
SMITH — "*Parks and Pleasure Grounds.*"
KENNION — "*Trees in Landscape.*"
LOUDON — "*Encyclopedia of Landscape-Gardening.*"
KOCH — "*Dendrologie.*"
DOWNING — "*Landscape-Gardening*" (Edited by Sargent); "*Rural Essays*"; "*Villa and Cottage Architecture.*"
SCOTT — "*The Art of Beautifying Home Grounds.*"
WEIDENMANN — "*Beautifying Country Homes.*"
KERN — "*Practical Landscape-Gardening.*"

These last four authors are Americans and their works, therefore, are especially interesting to the student who must work amid the same conditions. Scott's book has already been referred to. Although intended primarily for the amateur it will be very helpful to the professional student if he absorbs the principles it lays down and looks with a discriminating eye at its many illustrations. These last, however, cannot always be accepted as patterns of excellence, nor are the author's applications of his theories always as good as the theories themselves. Of his constructive work I cannot speak, but his book seems to reveal a man with more intelligence than taste — one who mentally recognizes what is right but is not always able to tell the best from the less good in special cases. Weidenmann's and Kern's books I have not read, but M. André cites them with respect. Downing's are extremely good — quite invaluable to the American beginner. Some day, when this art is understood and valued as it should be, Downing's will be recognized as one of the great names in the intellectual history of America. A pioneer in what, if not an actual wilderness, was a wilderness of ignorance, bad taste and indifference, he showed, alike in his writings and his practical results, the true spirit of an artist and the true instincts of a man of intelligence, education and taste. The places he laid out or altered — especially along the Hudson River — are still among the very best in the country; and almost all the good work which has since been done, including Mr. Olmsted's, may be traced back to his inspirations, while such measure of popular interest and good taste as we can lay claim to has almost altogether sprung from the same source. Twenty years ago his books were on every one's shelf and it would be well if as much could be said to-day. In architecture his taste was about on a level with that of his time — which is to say, was pretty bad. Yet even as regards architecture he had a good influence in so far that he first in his generation drew popular attention to its claims. And as regards landscape-gardening his ideas were far ahead of his time — and are still far ahead of ours if we may judge ideas by average results.

Koch's "*Dendrologie*" is a collection of lectures which treat in part of certain classes of trees, but also contain an interesting summary of the history of landscape-gardening in all ages of the world.

Outside of books like those I have mentioned, there are many others of many periods which it will profit the student to acquaint himself with. The love of Nature is as old as the world, and, strange though it may seem, expressed itself for ages in a love for cultivated Nature before the attractions of wild scenery were perceived. Literature which descants upon these latter charms is of comparatively modern origin, but literature which speaks or sings the praise of gardens begins almost as far back as history takes us. Roman literature, for example, as I need hardly say, is full of it, and though such writing gives the student no practical instruction, it profits by awakening enthusiasm and stirring his artistic sense. Then, as we come farther down in time, we find a great deal of writing which has a more definite though not exactly a practical bearing upon modern work. So poetic, so idyllic in its nature is the landscape-gardener's art (specially so-called as distinguished from the formal gardening art of elder days), that we have no real right to be surprised when we find that before it actually began it was preached and foreshadowed by poets and essayists. The first great garden on the true landscape pattern of which we know was not created in tangible shape, but was pictured in "*Paradise Lost.*" And from Milton's day onwards far into the eighteenth century, we find the poets and essayists teaching the landscape-gardener how he should conceive and sometimes how he should execute his tasks. Bacon, Pope, Addison, Mason, White of Selborne, Thomson, Gray, Delille, Rousseau and Goethe all have written many pages which should have a fertilizing influence upon the student if he has a soul to be stirred as well as a body to be nourished by his art.

Numberless English, French and German books of practical as distinct from artistic or poetic bearing have been published during the past twenty years. A few of them may be cited as guides to the finding of others, although, of course, some are more valuable to foreign than to American readers:

DE LAMBERTYE — "*Conseils aux habitants des campagnes.*"
DECAISNE ET NAUDIN — "*Manuel de l'amateur des jardins.*"
JACQUES (and others) — "*Manuel général des plantes.*"
CARRIERE — "*Traité général des conifères.*"
ROBINSON — "*Alpine Flowers*" giving advice about rock work, etc.)
VILMORIN ET ANDRIEUX — "*Les Fleurs de pleine terre.*"
ANDRÉ — "*Plantes a feuillage ornemental.*"
DU BREUIL — "*Cours d'arboriculture*": "*Arbres et arbuisseaux.*'
ANDRÉ — "*Les Plantes de terre de bruyère.*"
STEWART — "*The Planter's Guide.*"
THOMSON — "*Handy-Book of the Flower-Garden.*"

And to these and such as these may be added books on the principles of color like those of Chevreuil and of Root.

More American works of similar kinds must exist than I have chanced to hear about. I can only suggest that it would be well to supplement strict botanical works by those like Emerson's "*Trees and Shrubs of Massachusetts,*" which describes the aspect as well as the characteristics of each species in a very clear and suggestive way. Professor Sargent's catalogue of the Jesup collection of American woods is also extremely useful as giving in compact shape not only a full list of all our native trees, but also the average sizes which they attain and the geographical limits within which they are

[1] Continued from page 264, No. 623.

at home.[1] American literature as well as English also offers a number of works of a descriptive sort which should please and inspire though they may not actually teach the student. The love of Nature and the habits of observation shown in the writings of Thoreau, for instance, and at the present moment of Charles Abbott and John Burroughs may do much to cultivate the same qualities in the reader.

It may seem a strange and it certainly is an unfortunate fact that there is to-day no periodical which either gives the landscape-gardener theoretic counsels or enables him to follow what is being done in the world in his profession. Such journals as the *Revue Horticole, the Revue de l'horticulture belge et étrangère, the Hamburger Garten und Blumenzeitung, the Journal of Horticulture, the Garden and the Gardener's Chronicle*, confine themselves altogether within the limits which their titles suggest. Even the first-named, although edited by M. André, does not treat of landscape art, but merely of some of the materials by means of which it works. In our own country, when Downing was alive, his words alone sufficed to give artistic value to the periodical for which he wrote — *the Horticulturist*, if I am not mistaken. But to-day we are no better off than our neighbors.

To turn away now from books to the living world, a word or two may be added with regard to sketching from Nature. Practice in this direction, if within the student's power, is, of course, useful not only as facilitating the execution of his working plans, and teaching him how to record the characteristics of those actual sites with which he will be called upon to deal, but also as training his eye to value the nicer relations of outlines, colors and masses. But I think he should guard himself against putting too high a value upon his sketches after they are made. They will differ from the works of professed painters in being records of Nature's casual results instead of careful, artistic adaptations — idealizations — of those results; and as such they are likely to be far less rich in suggestions with regard to the effects he himself must secure when he begins actual work. Moreover, too great a love for the generalized, undetailed charms proper to a sketch may foster a tendency to generalize, and, so to say, sketch too much when he addresses himself to concrete problems. As has been said before, the landscape-artist must, like the painter, think first and most of his general effect; but the care which he must give to all matters of detail is far greater since his public cannot be kept at a given distance, and, therefore, each feature in his composition is likely in its turn to become a foreground feature. But he has a quite modern helper which may profitably supplement his pencil. It seems to me that photography from Nature offers him an excellent means of study, as well as an invaluable means of storing up helpful memoranda. While photographing, as well as while drawing from Nature, he will learn to see the difference between good composition and bad, between effective and ineffective massing, between the changes wrought by different kinds of illumination, between "variety in unity" and a mere heterogeneous accumulation of features. He will also gradually acquaint himself with the characteristic forms and manners of growth of the various species of plants. And the pictures he produces, being much fuller of detail, will furnish him with a more valuable store of suggestions for his future work than any amount of sketches he may be able to produce. And then, not every one can learn to sketch, while every one can learn to photograph. Nor is it a very costly or laborious pursuit, since a small portable camera for instantaneous work will serve quite well enough.

The most important general counsel which can be given a student is to avoid all disposition to that narrowness of taste which will end by making him, as an artist, a man of set ideas, narrow schemes and mannerisms. Appropriateness is the prime virtue in landscape as it is in architectural work. But there is, perhaps, even more danger that the landscape-gardener will sin against it than that the architect will — even more danger that he will become a mannerist. The "styles" into which his art may be divided are as distinct as architectural styles; but the distinctions between them are more subtile, they pass more insensibly into each other, and it takes a very sensitive taste to decide when the one should be employed, and when the other, or when the best result may spring from a combination of several kinds of effect in the different parts of a large composition. A landscape is not a park, nor a park a garden, nor a garden a lawn, nor a lawn a shrubbery, nor a shrubbery a front-yard; nor is the aspect which each should wear, or the sentiment it should express by any means always the same. But there are no set rules which mark off the one from the other, nor any formulas by means of which even a "correct" treatment may be arrived at. Great as may be the diversity between an architect's different problems, the diversity between a landscape-gardener's is still greater; it may be called, in fact, coëxtensive with the actual number of his tasks. No two sites are ever exactly the same, and to secure appropriateness of effect the site must be as careful consulted as the buildings which may be planned to stand upon it, or the pecuniary resources, tastes and occupations of the client. Moreover, the elements out of which he must create his work of art are not codified as are the architect's. When he wants to design, every tiniest detail as well as every great feature must be settled upon by himself. He is thus the freest of all artists, but in his very freedom lies the danger that he will become a mannerist. It requires very catholic tastes, sensitive perceptions and conscientious alertness of enthusiasm to keep him from "getting round" his ever-varying difficulties by clinging to some single kind of effect, repeating some two or three features, and narrowing his almost unmanageably rich vocabulary down to a small list of plants to be combined and recombined with small regard to perfect fitness. If he proceeds thus he may produce fairly good work now and then, but will often produce very bad work, and never work which is quite as good as it ought to be. Even such a broad preference as that which would say, "Natural-seeming effects are better than formal effects" ought not to be indulged. That effect is best which is most appropriate, and when architecture comes prominently into the scheme, formality of the sort which means even clipped trees and trimmed hedges and discreetly colored pattern-beds may be the right thing, and an attempt at a landscape effect may be as wrong — though hardly as vulgar — a thing as is the formality, for example, of those hideously colored pattern-beds which in the Public Garden of Boston ruin what ought to be a landscape effect of the utmost purity, peace and softness.

In conclusion I may return to what I said in my first article about the influence which the architect may exert upon the progress of this sister-art. Too often in the past he has been, although unconsciously no doubt, its foe. Every time an architect has insisted upon placing his building as he thought it would show to the best advantage without narrowly considering how the whole place, whether great or small, might be treated to the best advantage, he has sinned against both his client and the art of landscape-gardening, while the chances are that he has defrauded himself, too — that had he consulted other rights than his own, his building would eventually have profited. Simply to be conspicuously placed is not always for a building to be well placed, though in many cases its designer seems to have thought as much.

Something more is needed than that an architect should advise his client to call in a landscape-artist when his own work has been done. Even this advice is not so often given as one might think — too frequently he seems to believe that an artist is needed for every building, but that Nature, chance and the client are competent to manage trees and water and surrounding surfaces and distant views. Each artist is equally needed, and the chief need is that they should work together from the very outset. If the landscape-gardener has studied architecture as he should, he is at least as competent as the architect to decide where a building should be placed to look well from a distance; and if he understands his own art, he is far better able to decide where it should be placed in order that the outside world shall look well from its windows — quite as important a consideration to its owners. Moreover, he alone can see the best suggestions of the site with regard to the laying-out of approaches and the establishment of all minor constructions, while his advice may be very helpful even in the question, what sort of an architectural design will best suit the locality? An architect ought to be willing to make great personal sacrifices, if it is proved to him that great benefit to general beauty in the common result will follow; but very often no such sacrifices will be needed. Very often such slight modifications of his wishes as the stubbornest spirit would not object to making may result in all the difference between a well-laid-out place with convenient dependencies and beautiful views, and a botched place whose owners, if they have eyes to see, will be perpetually tormented by the thought of what so easily might have been. Moreover, in certain things which are actually of an architectural sort the landscape-gardener should be allowed to aid with a very free hand — in all of those which come in close contact with natural features. Piazzas, terraces, external stairs, steps and seats, summer-houses, boat-houses, bridges, balustrades and boundary-walls should, whenever possible, be built with his assistance.

Whenever we find ourselves considering what are the duties of the architect towards other arists, or how he should try to perfect his own results by incorporating theirs, we find ourselves thinking of Mr. Richardson as a shining example of rectitude. He was constantly turning to Mr. Olmsted for advice, even in those cases where it seemed as though it could have little practical bearing upon his design. And where it could have more conspicuous bearing he worked with him as a brother-artist of equal rank and of equal rights with himself. The Town-Hall at North Easton may be cited as one example of the extraordinary success which can spring from such co-operation, and Mr. Richardson was never tired of explaining how invaluable in this case had been Mr. Olmsted's assistance.

So firm a grasp of the essentials of architectual excellence as Mr. Olmsted possesses, and so true a taste with regard to architectural beauty, are, of course, exceptional. But something akin to them should be striven for by every student of landscape-gardening as one of the prime requirements of his art. Few landscape-gardeners can hope ever to put themselves as nobly on record with regard to actual architectural work as Mr. Olmsted has recently done in those alterations of the Capitol at Washington which are to be largely credited to his inspiration and his oversight. But they must, at least, put themselves on record as intelligent assistants in the architectural schemes of others if they would merit the name of artists in their own department. On the other hand, with the best will in the world

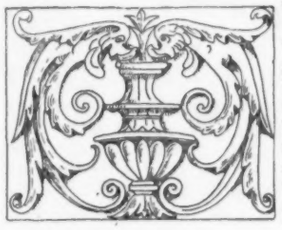
[1] The Arboretum which Professor Sargent is now planting for Harvard College in Bussey Park near Boston, will in future years afford the student an invaluable means of acquainting himself with all the trees and shrubs, native and foreign, which are hardy in that climate. Even in its present incomplete and immature condition, the help it may give him is considerable. And the way in which it has been planned should be studied as an excellent application of the highest principles of landscape-gardening. The formality usually involved in such scientific assemblages of plants has been entirely avoided, and the Arboretum will form an harmonious and beautiful part of a rural park. Yet in itself it is as scientific in arrangement as though utility only had been considered.

not every architect will always be able to secure competent assistance of the sort I have described. Mr. Richardson had Mr. Olmsted living at his gates, and Mr. Richardson had, too, a singular power of persuading his clients to do whatever he thought best. For fear that such advantages as these may lack — and as things stand just now with the art of landscape-gardening they often must lack — would it not be well if every architectural student should gain some knowledge of the sister-craft, at least as regards the general artistic principles upon which it rests, and the main things it requires of a building when elsewhere placed than in a city street?

M. G. VAN RENSSELAER.

UNITED STATES GOVERNMENT BUILDING PRACTICE.[1] — VIII.

PAVING, ROADWAYS AND CURBING.



DETAIL OF TOMB
CATHEDRAL OF AMIENS

PAVING for sidewalks and for streets and roadways, made of almost every material known and used for the purpose in the United States has been used by the Government around its buildings. The kind of material is determined frequently by what is most in use in the particular locality for which the work is required, the character or expensiveness of the building for which it is needed, or by the amount of money available for the work.

For paving of sidewalks, the materials most often used are artificial stone and brick, and for paving roadways, streets, etc., Belgian blocks, concrete and macadam.

Bids are received in one lump-sum for all the work on the approaches, including sidewalks, driveways, walks, curbing, fence-coping, grading, sodding, etc. Fence-coping, grading and sodding have been treated in previous papers.

SPECIFICATION.

The plan of approaches shows clearly the paved sidewalks, drives, walks, roadways and the lines of curbing, etc.

Excavating. — All excavating for sidewalks, roadways, curbing, etc., to be performed by the contractor to the proper depth; also, any filling-in, grading, ramming, etc., that may be necessary for the proper execution of the work.

Brick Paving. — Brick paving to be with good hard paving-bricks, sound and square, laid flat, herring-bone fashion, on a bed of sand from 4″ to 6″ deep. [Some soils require a deeper bed of sand and in some places in addition a bed of furnace-clinkers, cinders, etc., is put down before the sand.] After the bricks are laid and graded (which should be about 1″ in 10′) to drain water to curb or to its proper outlet, the entire surface must be covered with sand, which must be left to work into the joints or swept over the bricks until the joints are thoroughly filled; or, to make a better pavement, the joints should be grouted in liquid mortar and the sand spread over afterwards.

Where gutters are to be formed with brick, the bricks in the centre should be laid lengthwise and the joints should always be grouted in liquid cement-mortar. Where extra thickness of wearing surface is required, the bricks may be laid on edge and grouted or covered with sand as before.

Brick and Cement Pavement. — A pavement made of brick and cement is often laid by the Government in Southern cities. It has a base of furnace-clinkers or clean sharp sand 4″ deep rammed and packed solid, on which brick is laid flat to an even surface; after being well wet, all the interstices to be thoroughly grouted with liquid cement-mortar; another layer of paving-brick is laid flat on top, breaking joint both ways with ¼″ thick layer of mortar between the bricks, and the top layer also grouted in liquid mortar. The wearing-surface to be ¾″ thick cement-mortar, composed of one part cement and one part of finely-crushed granite or sand. When the wearing-surface for this pavement has been laid of the cheaper grades of cement, it has not stood well, but when laid of good Portland cement, it makes a good pavement.

Stone Flagging. — Where stone flagging is used, it is to have a base of sand not less than 4″ deep. The flagging may be bluestone from 3″ to 5″ thick or granite or limestone from 6″ to 10″ thick, the stones generally to be rectangular in sizes from 2′ x 4′ to 5′ x 10′; to be properly dressed at corners to fit against curbing, etc; the backs to be roughly pitched off to a fair surface, and the joints to be square from the top and to fit close; the top, if of bluestone, to be the split surface, smoothed or planed off; if of granite, to be good pean-hammered work, and if of limestone, to be sawed, square-drove or tooled work; all the flagging to have a regular grade to curb, to be jointed in cement-mortar, and also grouted full with liquid mortar.

Concrete and Artificial-stone Pavements. — All concrete, asphalt and artificial-stone pavements to have for a base a bed of concrete from 6″ to 10″ deep, composed of five parts by measure of clean, small, broken stone (not larger than 2″ in diameter), brick-bats, furnace-slag or cinders, one part of good American cement, and two parts of clean, sharp sand, laid in same manner as concrete for foundations.

Cement Floor. — For cellar floors and sidewalks the wearing-surface may be ¾″ to 1¼″ thick, composed of one part by measure of Portland cement and one part sand.

Asphalt Pavement. — Asphalt is used for the wearing-surface for floors, sidewalks and driveways. For floors and sidewalks it is made from ½″ to 1¼″ thick, and for driveways it is made from 1½″ to 2″ thick. It is composed of two parts by measure of asphalt (unmixed with the products of coal-tar), with twenty per cent of heavy petroleum oil, five parts of sand, one part of powdered carbonate of lime, and one part of pitch. The concrete base must be perfectly dry before the wearing-surface is laid on, which must be properly crowned, graded, rammed and rolled. A surface is also sometimes made of about five-eighths sand three-eighths asphalt.

The street pavement in the District of Columbia is usually made on a 6″ base of concrete, with a cushion coat of asphalt ½″ thick, and wearing-surface of asphalt, petroleum oil, sand, pitch, etc., of above proportions 2″ thick.

Artificial-Stone Pavement. — All artificial stone is practically the same, the principal ingredients being Portland cement, crushed stone and sand. In the ordinary pavements clean, sharp sand is used instead of crushed stone. The pavements known in the market as granolithic and flintolithic have crushed granite and flint chips respectively mixed with the cement. The base is composed of small dry, broken stone, etc., from 4″ to 8″ thick, rammed and packed solid; on this base Portland-cement concrete 2½″ thick is laid, composed of two parts stone to one part of mortar, which is to be one part cement and one part sand. The finishing coat to be 1¼″ thick of clean, crushed stone-chips or clean, sharp sand and best English or German Portland cement, mixed in equal parts; to be laid in alternate blocks of from 2′ to 6′ square, with ¼″ indentations on the surface except at joints, which will have a smooth border 1½″ or 2″ wide. It is this blocking or lining off the pavements which Schillinger claims his patent covers, but which is not yet decided by the courts.

Macadamized Roadways. — The cheapest roadway laid by the Government is macadam, constructed of a layer from 8″ to 12″ thick of small, broken stone suitable for road-metal of a size to pass through a 2″-diameter ring and finished with coarse gravel properly crowned and rolled. The walks not used for driveways should have a layer of coarse sand about 1″ thick on top of gravel. The writer has seen some very excellent macadamized roads made of broken limestone without any gravel or sand; in a few years the wear of usage, assisted by the action of the weather, has made a solid and compact bed almost like a mass of concrete, with few, if any, loose stones. Streets of this description may be seen in the towns of Lexington, Va., and Paducah, Ky.

Belgian-block Pavement. — The bed of roadway to be built of 4″ of gravel or broken stone (this first bed is frequently omitted) on top of this is placed 4″ of sand. The blocks to be hard and durable granite or limestone from 6″ to 12″ long, 3″ to 5″ wide and 6″ deep, to be close-jointed with projections of not over ½,″ and to be laid at right angles to line of roadway, and each block to be thoroughly rammed and bedded; each course to be of blocks of uniform width, and so laid that all longitudinal joints shall be broken by a lap of at least 2″. The pavement to be properly crowned and graded, and to have depressions forming gutters at curbs.

The entire pavement is to have all the joints thoroughly filled with clean, hot gravel, and the blocks carefully rammed to a firm unyielding bed. The joints to be filled with the melted residuum of coal-tar of the proper consistency heated to 300° Fahrenheit, and poured into the joints while the gravel is still hot, until they will receive no more; the whole is then to be covered with sand, and when the tar is hard and dry the sand to be swept off.

Cobble-stone Pavement. — This pavement should have a 4″ bed of sand, the stones are irregularly shaped boulders, but should have an average depth of from 4″ to 6″, and not exceed 6″ on the face, they should be crowned higher than other pavements and have gutters against curbs, the sides formed of cobble-stones and the centre about 8″ wide of hard paving-bricks set on edge. The interstices between the stones to be filled with fine gravel, and the whole covered with sand and left until it thoroughly works in. It is best not to remove the sand until after a good rain.

Gutters. — All roadways, drives and walks should have gutters built against the curbing, at each side where practicable, properly connected to iron or tile-drains carrying the water off; where the pipes are likely to become clogged with refuse, the outlets to be properly protected by gratings or wire screens.

Gutters for macadamized or cobble-stone pavements are frequently built of brick laid flat or on edge on a bed of concrete or sand. All gutters should have the joints fully grouted with tar, asphalt, or liquid cement.

Curbing. — All sidewalks are to have a stone-curbing separating them from the roadway and drives, and there must also be a curbing between the grass and sidewalks, drives and walks, with gutters to prevent water from grass flowing across same.

The cheapest kind of curbing is of bricks set on end, which should be in perfect line, and have no projection above the sod on one side or the walk on the other, depending upon the purpose for which it is wanted. Stone-curbing may be of granite, limestone or

[1] Continued from No. 268, page 623.

blue-stone, and seldom of freestone or sandstone, it should extend deep enough in the ground to avoid all danger of dislocation by frost. If of blue-stone it is usually made 4″ thick, and if of granite or limestone from 6″ to 10″ thick, and in as long lengths as practicable; to be properly rounded at corners, and all exposed surfaces to be dressed smooth, rubbed, square-drove, or tooled-worked for soft stone and pean-hammered, or No. 6 cut for granite; the top surfaces to be bevelled to conform to grade of sidewalk. The curbing to be set in perfect alignment, and to the required grades.

MEASUREMENT.

Stone flagging and artificial-stone pavements are usually measured and estimated by the square foot; all other pavements, roadways, etc., by the square yard; the actual net surface after laying is to be measured.

Gutters are estimated by the lineal foot, giving description as to materials and construction; and curbing also by the lineal foot, giving kind of stone and dimensions, with quantity of face-dressing necessary.

COST.

The prices given per unit are for the completed work, including excavating and base unless otherwise stated.

The cost of stone flagging is dependent entirely upon the locality and the kind of stone.

Granite at St. Louis, 10″ thick, cost, per square foot	$1.00
" " Augusta, Me., 6″ rough, cost, per square foot	.30
Limestone at Jackson, Tenn., 4″ thick, cost, per square foot	.45 to .50
" " " " 6″ " " " " "	.60

The cost of artificial stone, concrete and asphalt depends upon the locality, as to tools, implements, etc., being convenient for the work.

Artificial Stone (Gravel), at Poughkeepsie, N. Y., cost, per sq. ft.	$.18
" " (Crushed Stone), at Poughkeepsie, N. Y., cost, per sq. ft.	.28
" " (Granolithic), " " " " " "	.35
" " " " Greensboro', N. C., " " "	.34
" " " " Jackson, Tenn., " " "	.35
" " " " Memphis, Tenn., " " "	.48

The cost of excavating and base must be added to the following prices per square foot, which are for the facing only.

Asphalt facing, 1″ thick, at Philadelphia, cost	$ .09
" " 1½″ " " " "	.14
Mastic " 1″ " " Cincinnati, "	.10
" (Seyssel), 1″ " " Philadelphia, "	.22
" (Vohwohlen), 1″ thick, at Philadelphia, cost	.11 to .13
" (Neufchatel), 1″ " " " " "	.23
Concrete and asphalt, 8½″ thick, streets in Washington, cost, per sq. yd.	2.30
Concrete and asphalt, 6″ thick, streets in San Francisco, cost, per sq. yd.	1.80
Concrete, composed of small stones, sand, and tar, at Concord, N. H., cost, laid hot 3″ thick, per sq. yd.	.60
Concrete, composed of small stones, sand, and tar, at Concord, N. H., cost, laid cold, 3″ thick, per sq. yd.	.45
Concrete, composed of small stones, sand, and tar, at Concord, N. H., cost, laid hot 5″ thick, per sq. yd.	.75
Brick-paving costs, per square yard	.75 to 1.00
Double layer of brick and cement costs, per sq. yd.	1.80 to 2.00
Macadamizing, 8″ to 10″ thick, costs, per sq. yd. (depending on the nearness of the stone)	.35 to .50
Cobble-stone pavement costs, per sq. yd.	.60 to .75
Belgian-block pavement " " "	2.75 to 3.50
Limestone blocks at Terre Haute costs, per sq. yd.	2.70
Granite blocks at Philadelphia " " "	2.78
" " " St. Louis " " "	3.50

Gutters cost about the same as the above materials with a slight addition for shaping them.

Curbing for sidewalks, etc., costs, per lineal foot	$ .75 to 2.25
Limestone curb, 6″ × 2′, at Kansas City, cost	.78
" " 6″ × 2′ 6″, at Jackson, Tenn., cost	1.50
" " 6″ × 3′ " " " "	2.25
Granite " 8″ × 3′ " New Orleans, "	2.00
Bluestone " 4″ × 20″ " Concord, N. H., "	.45

JAS. E. BLACKWELL.

[To be continued.]

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

LEIF ERICSON. BOSTON, MASS. ANNE WHITNEY, SCULPTOR.

[Gelatine Print, issued only with the Imperial Edition.]

THIS statue, slightly more than life size, cast in bronze and supported on a red sandstone pedestal near the entrance to the new park was unveiled, October 29, 1887. The inscription

LEIF,
THE DISCOVERER,
SON OF ERICK,
WHO SAILED FROM ICELAND
AND LANDED ON THIS CONTINENT
A. D. 1000

gives a brief explanation of its presence.

CONSTRUCTION OF FLOORS IN A FLOUR WAREHOUSE, PHILADELPHIA, PA. MR. W. B. POWELL, ARCHITECT, PHILADELPHIA, PA.

SEE Mr. Powell's letter elsewhere in this issue.

SKETCH OF HOUSE FOR T. E. JONES, ESQ. MR. E. G. W. DIETRICH, ARCHITECT, NEW YORK, N. Y.

DESIGN FOR A CITY FRONT. MR. E. R. TILTON, ARCHITECT, NEW YORK, N. Y.

MANTELPIECE. MR. J. R. RHIND, ARCHITECT, MONTREAL, CAN.

CLOISTER OF SANTO DOMINGO, SALAMANCA, SPAIN.

THE TAYLOE MANSION. THE OCTAGON HOUSE, WASHINGTON, D. C.

BISHOP MEAD, in his "*Old Churches, Ministers and Families of Virginia*," tells us that William Tayloe emigrated from London to Virginia in 1650. John Tayloe, his son, who was a member of the House of Burgesses, founded the noted estate of Mount Airy, Virginia. He had twelve children, one of whom, Col. John Tayloe, built the old Octagon House. The Tayloes intermarried with the Corbins, the Lees, the Washingtons, the Carters, the Pages and nearly every other prominent family of Virginia. The mother of Col. John Tayloe, of the Octagon, was a daughter of Governor Plater of Maryland, and his wife was Anne, daughter of Benjamin Ogle, Governor of Maryland.

For those days, Col. John Tayloe (commissioned by Washington in the Revolution) was a very wealthy man, having at the age of twenty an income of nearly sixty thousand dollars a year, and when the Octagon was built he had an income of seventy-five thousand a year. His eldest son, John, was in the Navy and was distinguished in the battles of the "*Constitution*" with the "*Guerriere*," and the "*Cyane*" in the Levant.

The memoirs of Benjamin Ogle Tayloe state that Colonel Tayloe was an intimate friend of General Washington, and it was on the advice of the General that the Octagon was built in Washington City, Colonel Tayloe having previously determined to build his winter residence in Philadelphia.

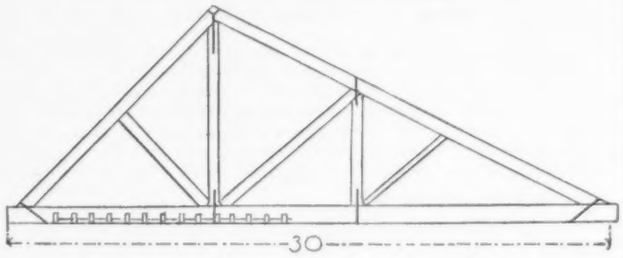
The house was commenced in 1798 and was completed in 1800. During the process of erection, General Washington visited this building, as he took a lively interest in it, being the home of his friend and one of the most superior residences in the country at the time. After the war of 1812, the British having burned the White House, James Madison occupied the Octagon for some time and during his occupancy the Treaty of Ghent between the United States and Great Britain was signed by him in February, 1815, in the circular room over the vestibule, shown on the plan in illustrated plate.

At this period Colonel Tayloe was distinguished for the unrivalled splendor of his household and equipages, and his establishment was renowned throughout the country for its entertainments, which were given in a most generous manner to all persons of distinction who visited Washington in those days, both citizens and foreigners. In this list would be included such names as Jefferson (Washington had passed away before its completion), Madison, Monroe, J. Q. Adams, Decatur, Porter, Webster, Clay, Calhoun, Randolph, Lafayette, Steuben and Sir Edward Thornton, British Minister and father of the recent British Minister, and many others of less distinction than the ones named. Colonel Tayloe died in 1828 and his death to a certain extent terminated the splendid hospitalities of the Octagon, which had covered a period of nearly thirty years.

This house is well built of brick, trimmed with Aquia Creek sandstone. The lot is triangular in form and fenced in by a high brick wall. The kitchen, stable and out-houses are built of brick for the accommodation of servants and horses, Colonel Tayloe being a noted turfman and keeping many fine running horses. The building and walls conform accurately to the street lines, showing that the streets were accurately laid off even at that early day. The interior is elaborately finished, the doors and shutters being of mahogany and all still in an excellent state of preservation. All the work in the circular vestibule coincides with the circumference of the tower, the doors, sash and glass being made on the circle, and all are still in working order. The parlor mantel, illustrated on plate, is made of a fine cement composition and is painted white. The remains of gold-leaf show in some of the relieved portions. The figures are excellent, evidently having been modelled by some good artist. The mantel in the bed-room is of wood, the ornamentation being putty stucco. From the work of Bielefeld on papier-maché, I learn that the different methods of making the plastic ornaments at that date was putty, commonly used on mantels or flat work, where they were not carved in the wood, (this is the material with which most of our Colonial work is ornamented) papier-maché, carton-pierre, cement and plaster. Carton-pierre was a composition of whiting, oil and paper and was hard and easily polished, and I am inclined to the opinion that the parlor and dining-room mantel in the Tayloe House is of this material. The oldest cabinet-makers, and I have interviewed many of them in this section of the country, are entirely ignorant as to the method or composition of such ornaments, and books, with the exception of the one mentioned above, seem to have ignored the subject. Leading into the back hall and dining-room are two secret doors, in which the wash-boards, chair-boards, etc., run across the door, being ingeniously cut some distance from the actual door, no key-holes, hinges or openings showing on the blind side. The knobs and shutter-buttons are of brass and of the pattern shown in the sketch. The roof has three rather peculiar trusses of

the shape shown in the sketch, that and all timbers visible being hewn. Two old cast-iron wood-stoves still stand in the niches prepared for them in the vestibule. There is an old negro living whose duty it was to keep them supplied with fuel.

Dr. William Thornton was the architect. Dr. Thornton was a



Truss in Roof of The Octagon.

very interesting character and is deserving of a separate article. I hope at some time to be able to put the matter I have in shape for publication.

GLENN BROWN.

SAFE BUILDING.—XXI.[1]

FLOOR BEAMS AND GIRDERS.

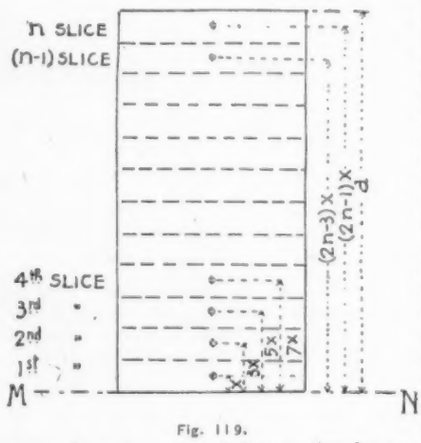


Fig. 119.

Moment of Inertia. The writer has so often been asked for more information as to the meaning of the term *Moment of Inertia* that a few more words on this subject may not be out of place.

All matter, if once set in motion, will continue in motion unless stopped by gravity, resistance of the atmosphere, friction or some other force; similarly, matter, if once at rest, will so remain unless started into motion by some external force. Formerly it was believed, however, that all matter had a certain repugnance to being moved, which had to be first overcome, before a body could be moved. Probably in connection with some such theory the term arose.

In reality matter is perfectly indifferent whether it be in motion or in a state of rest, and this indifference is termed "Inertia." As used to-day, however, the term Moment of Inertia is simply a symbol or name for a certain part of the formula by which is calculated the force necessary to move a body around a certain axis with a given velocity in a certain space of time; or, what amounts to the same thing, the resistance necessary to stop a body so moving.

In making the above calculation the "sum of the product of the weight of each particle of the body into the square of its distance from the axis" has to be taken into consideration, and is part of the formula; and, as this sum will, of course, vary as the size of the body varies, or as the location or direction of the axis varies, it would be difficult to express it so as to cover every case, and therefore it is called the "Moment of Inertia." Hence the general law or formula given covers every case, as it contains the Moment of Inertia, which varies, and has to be calculated for each case from the known size and weight of the body and the location and direction of the axis.

In plane figures, which, of course, have no thickness or weight, the *area* of each particle is taken in place of its weight; hence in all plane figures the Moment of Inertia is equal to the "sum of the products of the area of each particle of the figure multiplied by the square of its distance from the axis."

Calculation of Moment of Inertia. Thus if we had a rectangular figure (119) b inches wide and d inches deep revolving around an axis M–N, we would divide it into many thin slices of equal height, say n slices each of a height $= 2.\ X$.

The distance of the centre of gravity of the first slice from the axis M–N will, of course be $= \frac{1}{2}.\ 2.\ X. = 1.\ X$

The distance of the centre of gravity of the second slice will be $= 3.\ X$,

that of the third slice will be $= 5.\ X$,
that of the fourth slice will be $= 7.\ X$,
that of the last slice but one will be $= (2\,n-3).\ X$.
and that of the last slice will be $= (2\,n-1).\ X$

The area of each slice will, of course, be $= 2.\ X.\ b$; therefore the Moment of Inertia of the whole section around the axis M–N will be (see No. 536, p. 163),

$$i = 2.\ X.\ b.\ (1.\ X)^2 + 2.\ X.\ b.\ (3.\ X)^2 + 2.\ X.\ b.\ (5.\ X)^2 + 2.\ X.\ b.\ (7.\ X)^2 + \text{etc.} \ldots\ldots + 2.\ X.\ b.\ [(2n-3).X]^2 \quad 2.\ X.\ b.[(2n-1).X]^2 \text{ or,}$$

$$i = 2.X.^3 b.\ [1^2 + 3^2 + 5^2 + 7^2 + \text{etc.} \ldots\ldots + (2n-3)^2 + (2n-1)^2]$$

now the larger n is, that is the thinner we make our slices, the nearer will the above approximate:

$$i = 2.\ X^3.\ b.\ \left[\frac{4}{3}.\ n^3\right]$$

$$= 8.\ X^3.\ n^3.\ \frac{b}{3}$$

Therefore, as: $2.\ X.\ n = d$ we have, by cubing,

$8.\ X^3.\ n^3 = d^3$; inserting this in above, we have:

$$i = \frac{d^3.\ b.}{3} \text{ or } \frac{b.\ d^3}{3}$$

The same value as given for i in Table I, section No. 29. Of course it would be very tedious to calculate the Moment of Inertia in every case; besides, unless the slices were assumed to be very thin, the result would be inaccurate; the writer has therefore given in Table I, the exact Moments of Inertia of every section likely to arise in practice.

Moment of Resistance. The Moment of Inertia applies to the whole section, the "Moment of Resistance," however, applies only to each individual fibre, and varies for each; it being equal to the Moment of Inertia of the whole section divided by the distance of the fibre from the axis.

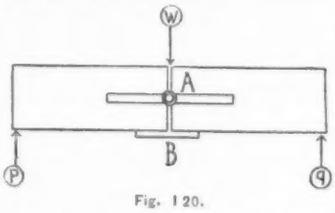


Fig. 120.

Now to show the connection of the Moments of Inertia and Resistance with transverse strains, let us consider the effect of a weight on a beam (supported at both ends).

If we consider the beam as cut in two and hinged at the point A (where the weight is applied), Fig. 120; further, if we consider a piece of rubber nailed to the bottom of each side of the beam, it is evident that the effect of the weight will be, as per Fig. 121.

Effect of load on beam. Examining this closer we find that the corners of the beams above A (or their fibres) will crush each other, while those below A, are separated farther from each other, and the piece of rubber at B greatly stretched. It is evident, therefore, that the fibres nearest A experience the least change, and

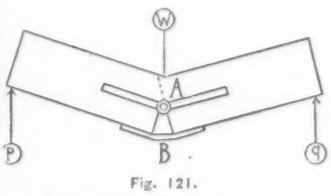


Fig. 121.

[1] Continued from page 266, No. 623.

GLOSSARY OF SYMBOLS.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.:—

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{d}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3 1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{I}, a_{II}, a_{III}, etc., or b, b_{I}, b_{II}, b_{III}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance:—

m = moment or bending moment at *centre*.
m_{A} = " " " *point A*.
m_{B} = " " " *point B*.
m_{X} = " " " *point X*.
s = strain at *centre*.
s_{B} = " *point B*.
s_{X} = " *point X*.
v = stress at *centre*.
v_{D} = " *point D*.
v_{X} = " *point X*.
w = load at *centre*.
w_{A} = " *point A*.

that the amount of change of all the fibres is directly proportionate to their distance from A (as the length of all lines drawn parallel to the base of a triangle, are proportionate to their distance from the axis); further, that the fibres at A experience no change whatever. Now, if instead of considering the effect of a load on a hinged beam we

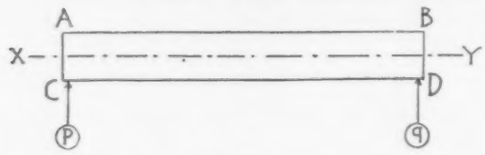


Fig. 122.

took an unbroken beam, the effect would be similar, but, instead of being concentrated at one point, it would be distributed along the entire beam; thus the beam A B D C (Fig. 122) which is not loaded. becomes when loaded, the slightly curved beam (A B D C) Fig. 123.

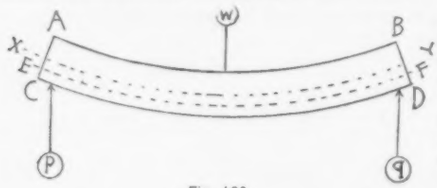


Fig. 123.

It is evident that the fibres along the upper edge are compressed or A B is shorter than before; on the other hand the fibres along C D are elongated or in tension, and C D is longer than before; if we now take any other layer of fibres as E F, they — being below the neutral (and central)[1] axis X–Y — are evidently elongated; but not so much so, as C D: and a little thought will clearly show that their elongation is proportioned to the elongation of the fibres C D, directly as their respective distances from the neutral axis X–Y. It is further evident that the neutral axis X–Y is the same length as before, or its fibres are not strained; it is, therefore, at this point that the strain changes from one of tension to one of compression.

Rotation around neutral axis.

In Fig. 124 we have an isometrical view of a loaded beam. Let us now consider an infinitesimally thin (cross) section of fibres A B C D in reference to their own neutral axis M–N. It is evident that if we were to double the load on the beam, so as to bend it still more, that the fibres along A B would be compressed towards or would *move* towards the centre of the beam; the fibres along D C on the contrary would be elongated or would *move* away from the centre of the beam.

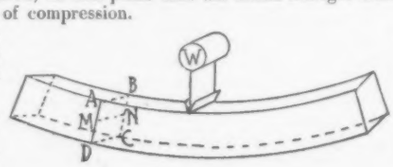


Fig. 124.

The fibres along M–N, being neither stretched nor compressed, would remain stationary.

The fibres between M–N and A B would all move towards the centre of the beam, the amount of motion being proportionate to their distance from M–N; the fibres between M–N and D C on the contrary would move away from the centre of the beam the amount of motion being proportionate to their distance from M–N; a little thought, therefore, shows clearly that the section A B C D turns or rotates on its neutral axis M–N, whenever additional weight is imposed on the beam.

This is why we consider in the calculations the moment of *Inertia* or the amount of resistance of a *cross-section* as *rotating* on its neutral axis.

Now let us take the additional weight off the beam and it will spring back to its former shape, and, of course, the fibres of the infinitesimally thin section A B C D will resume their normal shape; that is, those that were compressed will stretch themselves again, while those that were stretched will compress themselves back to their former shape and position, and those along the neutral axis will remain constant; or, in other words, this thin layer of fibres A B C D can be considered as a double wedge-shaped figure A B A, B, M N D C D, C, (Fig. 125) the base of the wedges becoming larger or smaller as the weight on the beam is varied.

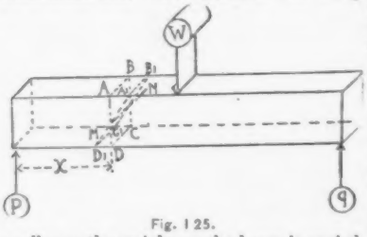


Fig. 125.

Resistance of Wedge.

Now to proceed to the calculation of the resistance of this wedge. It is evident that whatever may be the external strain on the beam at the section A B C D, the beam will owe whatever resistance it has at that point to the resistances of the fibres of the section or wedge to compression and tension.

Now considering the right-hand side of the beam as rigid, and the section A B C D as the point of fulcrum of the external forces, we have only one external force p, tending to turn the left-hand side of the beam upwards around the section A B C D, its total tendency, effect or moment m at A B C D, we know is $m = p.\ x$ (law of the lever).

Now to resist this we have the opposition of the fibres in the wedge A B A, B, M N to compression and the opposition to tension of the fibres in the wedge D C D, C, M N. For the sake of convenience, we will still consider these wedges, as wedges but so infinitesimally thin that we can safely put down the amount of their contents as equal to the area of their sides, so that — if A B $= b$ (the width of beam) and A D $= d$ (the depth of beam) — we can safely call *each* wedge as equal to $b.\ \frac{d}{2}$.

Now as the centre of gravity of a wedge is at $\frac{1}{3}$ of the height from its base, or $\frac{2}{3}$ of the height from its apex (and as the height of each wedge is $= \frac{d}{2}$) it would be $= \frac{2}{3} \cdot \frac{d}{2} = \frac{d}{3}$ from axis M–N. The moment of a wedge at any axis M–N is equal to the contents of the wedge multiplied by the distance of its centre of gravity from the axis, the whole multiplied by the stress of the fibres, (that is their resistance to tension or compression). Now the contents of each wedge being $= b.\ \frac{d}{2}$, the distance of centre of gravity from M–N $= \frac{d}{3}$, and the stress being say $= s$, we have for the resistance of *each* wedge

$$= b.\ \frac{d}{2} \cdot \frac{d}{3} \cdot s$$

$$= \frac{b.\ d^2}{6} \cdot s$$

Now if the stress on the fibres along the extreme upper or lower edges $= k$ (or the modulus of rupture), it is evident that the *average* stress on the fibres in either wedge will $= \frac{k}{2}$, or $s = \frac{k}{2}$ (for the stress on each fibre being directly proportionate to the distance from the neutral axis the stress on the average will be equal to half that on the base). Now inserting $\frac{k}{2}$ for s in the above formula, and multiplying also by 2, (as there are two wedges resisting), we have the total resistance to rupture or bending of the section A B C D (A, B, C, D,)

$$= \frac{b.\ d^2}{6} \cdot \frac{k}{2} \cdot 2$$

$$= \frac{b.\ d^2}{6} \cdot k$$

Now, by reference to Table I, section No. 2, we find that $\frac{b.d^2}{6} =$ Moment of Resistance for the section A B C D; therefore, we have proved the rule, that when the beam is at the point of rupture at any point of its length the bending moment at that point is equal to the moment of resistance of its cross-section at said point multiplied by the modulus of rupture.

Where girders or beams are of wood, it becomes of the highest importance that they should be sound and perfectly dry. The former that they may have sufficient strength, the latter that they may resist decay for the longest period possible.

Formation of Wood.

Every architect, therefore, should study thoroughly the different kinds of timber in use in his locality, so as to be able to distinguish their different qualities. The strength of wood depends, as we know, on the resistance of its fibres to separation. It stands to reason that the young or newly formed parts of a tree will offer less resistance than the older or more thoroughly set parts. The formation of wood in trees is in circular layers, around the entire tree, just inside of the bark. As a rule one layer of wood is formed every year, and these layers are known, therefore, as the "annular rings," which can be distinctly seen when the trunk is sawed across. These rings are formed by the (returning) sap, which, in the spring, flows upwards between the bark and wood, supplies the leaves, and returning in the fall is arrested in its altered state, between the bark and last annular ring of wood. Here it hardens, forming the new annular ring. As subsequent rings form around it, their tendency in hardening is to shrink or compress and harden still more the inner rings, which hardening (by compression) is also assisted by the shrinkage of the bark. In a sound tree, therefore, the strongest wood is at the heart or centre of growth. The heart, however, is rarely at the exact centre of the trunk, as the sap flows more freely on the side exposed to the effects of the sun and wind; and, of course, the rings on this side are thicker, thus leaving the heart constantly nearer to the unexposed side.

Heart-Wood.

From the above it will be readily seen that timber should be selected from the region of the heart, or it should be what is known as "heart-wood." The outer layers should be rejected, as they are not only softer and weaker, but, being full of sap, are liable to rapid decay. To tell whether or no the timber is "heart-wood"

[1] As a rule the neutral axis can be safely assumed to be central, but it is not necessarily so. In materials, such as cast-iron, stone, etc., where the resistance of the fibres to compression and tension varies greatly, the axis will be far from the centre, near the weaker fibres.

one need but look at the end, and see whether it contains the centre of the rings. No bark should be allowed on timber, for not only has it no strength itself, but the more recent annular rings near it, are about as valueless.

Medullary Rays. In some timbers, notably oak, distinct rays are noticed, crossing the annular rings and radiating from the centre. These are the "medullary rays," and are elements of weakness. Care should be taken that they do not cross the end of the timber horizontally, as shown at A in Fig. 126, but as near vertically as possible, see B in Fig. 127. The beautiful appearance of quartered oak and other woods is obtained by cutting the planks so that their surfaces will show slanting cuts through these medullary rays.

Seasoning cracks. All timber cracks more or less in seasoning, nor need these cracks cause much worry, unless they are very deep and long. They are, to a certain extent, signs of the amount of seasoning the timber has had. They should be avoided, as much as possible, near the centre of the timber, if regularly loaded, or near the point of greatest bending moment, where the

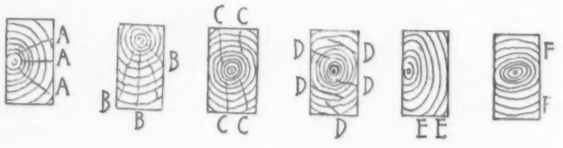


Fig. 126. Fig. 127. Fig. 128. Fig. 129. Fig. 130. Fig. 131.

loads are irregular. If timber without serious cracks cannot be obtained, allowance should be made for these, by increasing its size.

Vertical, or nearly vertical cracks (as C, Fig. 128) are not objectionable, and do not weaken the timber. But horizontal cracks (as D, Fig. 129), are decidedly so, and should not be allowed.

Knots. Knots in timber are another element of weakness. They are the hearts, where branches grow out of the trunk. If they are of nearly the same color as the wood, and their rings gradually die out into it, they need not be seriously feared. If, however, they are very dark or black, they are sure to shrink and fall out in time, leaving, of course, a hole and weakness at that place. Dead knots, — that is, loose knots, in a piece of timber, mean, as a rule, that the heart is decaying. Knots should be avoided at the centre of a beam, regularly loaded, and at the point of greatest bending moment, where the loads are irregular. The farther the knots (and cracks) are from these points the better.

Wind-shakes. Timber with "wind-shakes" should be entirely avoided, as it has no strength. These are caused by the wind shaking tall trees, loosening the rings from each other, so that when the timber is sawed, the wood is full of small, almost separate pieces or splinters at these points.

A timber with wind-shakes should be condemned as unsound.

A timber with the rings at the end showing nearly vertical (E Fig. 130) will be much stronger than one showing them nearly horizontal. (F Fig. 131.)

Signs of sound Timber. To tell sound timber, Lord Bacon recommended to speak through it to a friend from end to end. If the voice is distinctly heard at the other end it is sound. If the voice comes abruptly or indistinctly it is knotty, imperfect at the heart, or decayed. More recent authorities recommend listening to the ticking of a watch at the other end, or the scratching of a pin on its surface. If, in sawing across a piece it makes a clean cut, it is neither too green nor decayed. The same if the section looks bright and smells sweet. If the section is soft or splinters up badly it is decayed. If it wets the saw it is full of sap and green. If a blow on timber rings out clearly it is sound; if it sounds soft, subdued, or dull, it is very green or else decayed. The color at freshly-sawed spots should be uniform throughout; timbers of darker cross-section are generally stronger than those of lighter color (of the same kind of wood.)

The annular rings should be perfectly regular. The closer they are, the stronger the wood. Their direction should be parallel to the axis throughout the length of the timber, or it will surely twist in time, and is, besides, much weaker. Where the rings at both ends are not in the same direction the timber has either twisted in growing, or has a "wandering heart," — that is, a crooked one. Such timber should be condemned. Besides looking at the rings at the end, a longitudinal cut near the heart will show whether it has grown regularly and straight, or whether it has twisted or wandered.

The weight of timber is important in judging its quality. If specimens of a wood are much heavier than the well-known weight of that wood, when seasoned, they may be condemned as green and full of sap. If they are much lighter than thoroughly seasoned specimens of the same wood, they are very probably decayed.

Methods of Seasoning. Tredgold claims that timber is "seasoned" when it has lost one-fifth of its original weight (when green); and "dry" when it has lost one-third. Some timbers, however, lose nearly one-half of their original weight in drying. Many methods are used to season or dry timber quickly.

The best method, however, is to stack the timber on dry ground (in as dry an atmosphere as possible) and in such a position that the air can circulate, as freely as possible around each piece. Sheds are built over the timber to protect it from the sun, rain, and also from severe winds as far as possible.

Timber dried slowly, in this manner, is the best. It will crack somewhat, but not so much so as hastily dried timber. Many processes are used to keep it from cracking, the most effective being to bore the timber from end to end, at the centre, where the loss of material does not weaken it much, while the hole greatly relieves the strain from shrinkage. Some authorities claim that two years' exposure is sufficient, though formerly timber was kept very much longer. But even two years is rarely granted with our modern conditions, and most of the seasoning is done after the timber is in the building. Hence its frequent decay. There are many artificial methods for drying timber, but they are expensive. The best known is to place it in a kiln and force a rapid current of heated air past it, this is known as "kiln-drying." It is very apt to badly "check" or crack the wood. To preserve timber, besides charring, the "creosoting" process is most effective. The timber is placed in an iron chamber, from which the air is exhausted; after which creosote is forced in under a high pressure, filling, of course, all the pores which have been forced open by the suction of the departing air. Creosoted wood, however, cannot be used in dwellings, as the least application of warmed air to it, causes a strong odor, and would render the building untenantable.

Manner of shrinkage. In shrinking the distance *between* rings remains constant, and it is for this reason that the finest floors are made from quartered stuff; for (besides their greater beauty), the rings being all on end, no horizontal shrinkage will take place; the width of boards remaining constant, and the shrinkage being only in their thickness; neither will timber shrink on end or in its length. Figures 132 and 133 show how timber will shrink. The first from a quartered log, the other from one with parallel cuts. The dotted part shows the shrinkage. The side-pieces G in Fig. 133 will curl, as shown, besides shrinking. By observing the directions of the annular rings, therefore, the future behavior of the timber can be readily predicted. Of course, the figures are greatly exaggerated to show the effect more clearly.

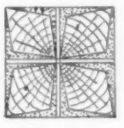


Fig. 132.

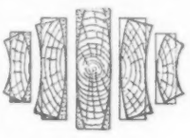


Fig. 133.

Decay of Timber. If the heart is not straight its entire length, the piece will twist lengthwise. Shrinkage is a serious danger, but the chief danger in the use of timber lies in its decay. All timber will decay in time, but if it is properly dried, before being built in, and all sap-wood discarded, and then so placed that no moisture can get to the timber, while fresh air has access to all parts of it, it will last for a very long time; some woods even for many centuries. In proportion as we neglect the above rules, will its life be short-lived. There are two kinds of decay, *wet* and *dry* rot. The wet rot is caused by alternating exposures to dampness and dryness; or by exposure to moisture and heat; the dry-rot, by confining the timber in an air-tight place. In wet rot there is "an excess of evaporation;" in dry rot there is an "imperfect evaporation." Beams with ends built solidly into walls are apt to rot; also beams surrounded solidly with fire-proof materials; beams in damp, close, and imperfectly ventilated cellars; sleepers bedded solidly in damp mortar or concrete, and covered with impervious papers or other materials; also timbers exposed only at intervals to water or dampness, or timbers in "solid" timbered floors.

Dry rot is like a contagious disease, and will gradually not only eat up the entire timber, but will attack all adjoining sound woodwork. Where rotted woodwork is removed, all adjoining woodwork, masonry, etc., should be thoroughly scraped and washed with strong acids.

Ventilation necessary. Where wood has, of necessity, to be surrounded with fireproof materials, a system of pipes or other arrangements, should be made to force air to same through holes, either in the floors or ceilings, but in no case connecting two floors; the holes can then be made small enough not to allow the passage of fire. Where the air is forced in under pressure it would be advisable at times to force in disinfectants, such as steam containing evaporated carbolic acid, fumes of sulphur, etc.

Coating woodwork with paint or other preparations will only rot the wood, unless it has been first thoroughly dried and every particle of sap removed.

Cross-bridging. Timber must not be used too thin, or it will be apt to twist. For this reason floor-beams should not be used thinner than three inches. To avoid twisting and curling, cross-bridging is resorted to. That is, strips usually $2'' \times 3''$ are cut between the beams, from the bottom of one to the top of the next one, the ends being cut (in a mitre-box), so as to fit accurately against the sides of beams, and each end nailed with at least two strong nails. The strips are always placed in double courses, across the beams, the courses crossing each other like the letter x between each pair of beams.

This is known as "herring-bone" cross-bridging. Care should be taken that all the parallel pieces in each course are in the same line or plane. The lines of cross-bridging can be placed as frequently as desired, for the more there are, the stiffer will be the floor. About six feet between the lines is a good average. Sometimes solid blocks are used between the beams, in place of the herring-bone bridging.

Cross-bridging is also of great help to a floor by relieving an individual beam from any great weight accidentally placed on it (such as one leg of a safe, or one end of a book-case), and distributing the weight to the adjoining beams. Unequal settlements of the individual beams are thus avoided. Where a floor shows signs of weakness, or lacks stiffness, or where it is desirable to force old beams, that cannot be well removed, to do more work, two lines of slightly wedge-shaped blocks are driven tightly between the beams, in place of the cross-bridging. The beams are then bored, and an iron rod is run between the lines of wedges, from the outer beam at one end to the outer beam at the other, and, of course, at right angles to all. At one end the rod has a thread and nut, and by screwing up the latter the beams are all forced upwards, "cambered," and the entire floor arched. It will be found much stronger and stiffer; but, of course, will need levelling for both floor and ceiling. Under the head and nut at ends of rod, there must be ample washers, or the sides of end beams will be crushed in, and the effect of the rod destroyed.

Stiffening weak floors.

Girders, which cannot be stiffened sideways, should be, at least, half as thick as they are deep, to avoid lateral flexure.

Framing of beams.

In using wooden beams and girders, much framing has to be resorted to. The used joints between timbers are numerous, but only a very few need special mention here. Beams should not rest on girders, if it can be avoided, on account of the additional dropping caused by the sum of the shrinkage of both, where one is over the other. If framing is too expensive, bolt a wide piece to the under side of the girder, sufficiently wider than the girder to allow the beams to rest on it, each side. If this is not practicable bolt pieces onto each side of the girder, at the bottom, and notch out the beams to rest against and over these pieces. The bearing of a beam should always be as near its bottom as possible. If a beam is notched so as to bear near its centre, it will split longitudinally. Where a notch of more than one-third the height of beam, from the bottom, is necessary, a wrought-iron strap or belt should be secured around the end of beam, to keep it from splitting lengthwise.

If framing can be used, the best method is the "tusk and tenon" joint, as shown in Figs. 134 and 135. In the one case the tenon goes through the girder and is secured by a wooden wedge on the other side; in the other it goes in only about a length equal to twice its depth, and is spiked from the top of girder. The latter is the most used. By both methods the girder is weakened but very little, the principal cut being near its neutral axis, while the beam gets bearing near its bottom, and its tenon is thoroughly strengthened to prevent its shearing off. The dimensions given in the figures are all in parts of the height of beams. Headers and trimmers at fire-places and other openings are frequently framed together, though it would be more advisable to use "stirrup-irons." The short tail-beams, however, can be safely tenoned into the header.

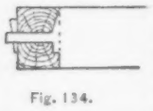


Fig. 134.

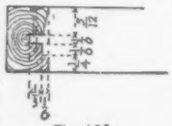


Fig. 135.

In calculating the strength of framed timber, the point where the mortise, etc., are cut, should be carefully calculated by itself, as the cutting frequently renders it dangerously weak, at this point, if not allowed for. For the same reason plumbers should not be allowed to cut timbers. As a rule, however, cuts near the wall are not dangerous, as the beam being of uniform size throughout, there is usually an excess of strength near the wall.

Stirrup-irons.

Stirrup-irons are made of wrought-iron; they are secured to one timber in order to provide a resting-place for another timber, usually at right angles to and carried by the former. They should always lap over the farther side of the carrying timber, to prevent slipping, as shown in Fig. 136.

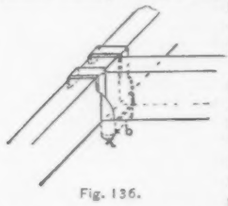


Fig. 136.

The iron should be sufficiently wide not to crush the beam, where resting on it; the section of iron must be sufficient not to shear off each side of beams. The twist must not be too sudden, or it will straighten out and let the carried timber down. To put the above in formulæ we should have:

for the width of stirrup-iron (x)

Width of Stirrup-irons.

$$x = \frac{s}{b.\left(\frac{c}{f}\right)} \qquad (69)$$

Where x = the width of stirrup-iron, in inches.

Where s = the shearing strain, in lbs., on end of beam, being carried.

Where b = the width of beam being carried, in inches.

Where $\left(\frac{c}{f}\right)$ = the safe resistance, in pounds, to compression, across the fibres, of the beam, being carried.

For the thickness of stirrup-iron we should have:

$$y = \frac{s}{2.x.\left(\frac{g}{f}\right)} \qquad (70)$$

Which for wrought-iron (Table IV.) becomes.

Thickness of Stirrup-iron.

$$y = \frac{s}{16000.x} \qquad (71)$$

Where y = the thickness of stirrup-iron, in inches.

Where s = the shearing strain on end of beam, in lbs.

Where x = is found by formula (69).

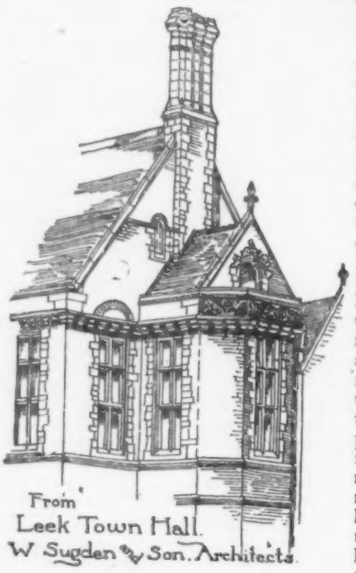
Providing, however, that y should never be *less* than one-quarter inch thick.

Louis DeCoppet Berg.

[To be continued.]

LONDON NOTES.

London, December 17, 1887.



YESTERDAY the first pitched battle was fought between the promoters of the Architects' and Engineers' Registration Bill, which is going to be introduced into Parliament next session by Colonel Duncan, R. A., M. P., and their opponents. The object of this movement is, no doubt, pretty well-known. There are a large number of architects in England who feel that architecture, as a profession, does not receive that protection from the State that it deserves. They point to the sister professions of law and medicine, and say, with much justice, that the honor and dignity of these professions is upheld by a State Regulation whereby no person may publicly practise, without having previously passed a qualifying examination.

Therefore these professions are kept clear of quacks, and the public, when it employs a lawyer or a doctor, feels confident that it is not throwing its money away upon mere charlatans, persons, in fact incompetent to carry out what they profess.

The other side reply that it is quite impossible to compare such professions as law and medicine with architecture. Architecture, they say, is an art, not a profession. Our companions are the painter and the sculptor, not the engineer and surveyor, and it is manifestly impossible to satisfactorily conduct an examination in a subject which is, after all, merely a matter of taste. Therefore to impose a uniform qualifying examination in architecture is, first of all, impossible; and, secondly, even if it were practicable, would be most undesirable. "We have in England," say they, "a delightful freedom in design, and we have only to point to France to show you what injurious effects are produced by this stifling of individual enterprise, and of liberty in design." And so the fight goes on.

The meeting last night was promoted by the Architectural Association, and was held in the Council Chamber of the Royal Institute of British Architects. The room was crowded to excess, and among those present I noticed Mr. Arthur Cates, the Chairman of the Board of Examiners for the Obligatory Examination in Architecture, Professor Kerr, of King's College, Mr. Roumien Gough, Leader of the Registrationists, and many other gentlemen of high standing in the profession. The eminent Oxford architect, Mr. T. G. Jackson, M.A., opened the discussion on behalf of the anti-Registrationists with a most able paper, abounding in neat hits and telling arguments, in which he strongly, almost vehemently, opposed the institution of qualifying examinations. He resumed his seat amid rounds of ringing applause. Speaker after speaker followed, but there was no doubt on which side the feeling of the meeting was; indeed, the students were at times a trifle too demonstrative in their hostility to the Registrationists. It was a little amusing, though, to see the neat way in which responsible speakers steered clear of the difficult subject, and I question very much if last night's meeting was more than a preliminary skirmish before the fight. There are exciting times before us, we may be sure.

I went to the Royal Academy the other day to see the exhibition of the Academy students' work for the past year. There was a large and fashionable gathering, but as usual the paintings were the chief attraction. "No doubt these are all very clever," said a lady to me, when looking at the architectural drawings, "but, you know, I really don't understand them. Let's go and look at the pictures."

The subject set for the Gold Medal and £200 Travelling Studentship was a Railway Station! Could any one, in his senses, have believed it possible that the august body at Burlington House would have descended to so matter-of-fact a subject. This is a "sign

of the times," with a vengeance. The difficulties of the problem were very courageously attacked in several cases, but the huge iron roof proved too much for most of the competitors. One or two tried, with more or less success, to treat it architecturally, but the majority hopelessly gave it up, and we were edified by most ingenious attempts to decorate the segmental end of the roof. The prize was, I think, fairly won by Mr. Schultz, though the decision of the judges met with a good deal of criticism.

The competition for an oil painting upon the suggestive word "Captives," produced a most interesting collection, the early Britons and their Roman masters being the favorite subject. One most attractive picture depicted a first-class railway-carriage containing a forger who had just been arrested, and his wife, while the detective in the corner, was sharply watching (over the top of his newspaper) the struggles of his prisoner to free himself from the "bracelets." Altogether the exhibition was pronounced to be highly satisfactory.

On Thursday, the Corporation of the City of London elected a city architect, in the place of the late Horace Jones, who received his knighthood, it will be remembered, when the Prince of Wales laid the foundation of the new bridge which is to be thrown across the Thames at the Tower. As the salary and emoluments of the office are considerable, there was a sharp competition. Mr. Alexander Peebles, an architect well-known in the "City," succeeded in gaining the appointment. Mr. Charles Barry, son of Sir Charles Barry, who designed the Houses of Parliament, and Mr. W. H. Crossland, architect to the Royal Holloway College, taking the second and third places respectively. "CHIEL."

COMMUNICATIONS

A FAULTY GROUND-TESTING APPARATUS.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—While waiting in the Baltimore depot at Washington I made the following notes, which I send to you:

While in Washington last Saturday I noticed the machine being used to test the soil under the footings for the new Government Library building of which you recently spoke editorialy, and it seemed that from the way it was constructed that it would give unsatisfactory results unless the greatest care was used in operating it, and even then I should think it would be inaccurate. It was not in operation when I saw it. Reference to the accompanying sketch will explain what follows.

The platform, loaded with bars of iron, rests upon two I-beams, each I-beam resting upon five or six supports flanging out to a broad base. The load was placed directly over four of the supports, but it was not evenly distributed over the platform. Now what impressed me was this: as soon as any one of these four supports begins to

settle, the load is thrown upon the supports not under the load and in amount inversely as the distance of the support from the centre of gravity of the load, but, as the soil may vary slightly, settlements might occur under some of the supports which would make it impossible to tell which ones carried the load and consequently how much load there was upon each. Although it would take more time, I should think that more satisfactory results could be obtained by having a larger base and only one, and thus testing one point at a time.

Very respectfully,
CLARENCE O. AREY.

LETTING EXTRAS TO AN OUTSIDER.

MONTREAL, CAN., December 15, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I would be obliged if you think proper to give an answer to the following. On the following question, A is the architect, P the proprietor, and C the contractor.

P gives a building contract for a certain amount, say $50,000, to C. Later on P wishes to give some new works, say cupboards and the like. He orders A to ask a couple of tenders for said work, one to C and one to an outsider. Then the tenders are in and it happens that the *outsider* is very much the lower on some items, though higher on others, and on the whole comes a little lower than C, say some $50 on $1,000 or job. P had some idea to give part of the job to one and part to the other according to their prices, but A had no difficulty in dissuading him from that, but P sticks to giving the extra contract to the outsider, while A thinks that is not absolutely fair. There is no ill feeling between A, P and C, the only thing is that A would not wish to look too much interested in C, but desires to give him full justice, and P, representing a committee, feels as if he had to be *positively legal*. The answer I wish, if you have the kindness to give it, should not be on the legality of P's intentions, but on the dignity to be observed on such matters. I remain, sirs,

Your obliged servant, J. V.

[THE answer to this question depends in some degree on the wording of the contract. There is no doubt that the ordinary courtesy among mechanics would give the contractor for the building the preference in any extra work that might be required. This does not mean, however, that he can get an extravagant price for it, and most architects, instead of getting estimates from two or three parties for the extra work, and thus putting themselves in the predicament of having either to accept the contractor's price, which they may consider too high, or give the work to an outsider, with the prospect of hard feeling and annoyance, find it better to order all extra work to be done by the general contractor, without stipulation beforehand as to the price further than that usually contained in the contract, that extra work shall be paid for "at a fair and reasonable valuation," and trust to their own authority for seeing this stipulation complied with. To illustrate this point: We once had some work done by a rather sharp contractor. A little extra work was necessary, and the owner asked us, rather against our judgment, to get an estimate from the contractor before ordering it. We did so, and the contractor estimated the work at eighty-five dollars. The real value was about fifteen dollars, and if we had been permitted to order it without question, we should have refused to certify for more than this, and the contractor would probably have accepted it without objection. His previous estimate of eighty-five, however, made it difficult to order him to do the work without, by implication, agreeing to his price, while an order to do the work for fifteen would have provoked a quarrel at once. We were obliged to escape from the dilemma, therefore, by notifying him that his offer was not accepted, and allowing him to finish his contract, sending some one else after he had got through to make the needed change. In the case of which our correspondent speaks, P, as acting for others, is quite right in thinking it important for him to accept the lowest tender for the work, but we think that A would be justified in saying that the annoyance of having two mechanics in the building would be worth nearly the difference, and C might well afford, in consideration of not being disturbed, to reduce his price to that of the other man.—EDS. AMERICAN ARCHITECT.]

BOOKS.

ROCHESTER, N. Y.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs:—Will you be kind enough to inform me what would be the best books to purchase, one of them a general treatise on Architecture of a constructional nature—also a good book on Interior Decoration. I would like the latest publications. Could you give me the cost and author of each, and where to be obtained?

Yours truly, F. A. BROCKETT.

["*Building Superintendence*" by T. M. Clark, published by Ticknor & Co., price $3. "*Notes on Building Construction*" by Col. Smith, published by Rivingtons, London, 3 vols., price $13.50; "*L'Art de batir*" by Daniel Ramée; "*Traité de l'Architecture*" by Léonce Reynaud. The latest book on decoration is "*Interior Decoration*" by A. W. Brunner and T. Tryon, published by W. T. Comstock, price $3.—EDS. AMERICAN ARCHITECT.]

ARCHITECTURAL JOURNALS.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs:—Kindly assist a student by giving names of architectural publications in France, Spain, Italy, Germany and Russia, and names of publishers. Names of journals published in other countries (not English) will also be "thankfully received."

Very respectfully, F. W. FITZPATRICK.

[*Revue Générale d' Architecture; Moniteur des Architectes; Encyclopédie d'Architecture; Bulletin Mensuel de la Société Centrale des Architectes; La Semaine des Constructeurs; La Construction Moderne*, all of Paris. *Deutsche Bauzeitung*, Berlin; *Weiner Bauindustrie Zeitung*, Vienna; *Architectonische Rundschau*, Stuttgart; *Zodtchy*, St. Petersburg; are among the most important.—EDS. AMERICAN ARCHITECT.]

WAREHOUSE FLOOR CONSTRUCTION.

PHILADELPHIA, PA., December 12, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In your last issue I notice under heading of "A Poorly-constructed Floor" several diagrams of post and girder construction, which, from the lack of proper precaution in the proportioning and placing of its parts, is decidedly dangerous by reason of the timbers forming the girders deflecting laterally and severally crushing, as in this case they have done and will continue to do beyond hope of repair. The system here attempted is one of the best that can be devised for continuous girders of wood, but the parts require the nicest adjustment to ensure stability. The element of shrinkage needs to be taken into account and parts so connected and designed as to admit of tightening up from time to time. I take pleasure in sending you blue prints [see Illustrations] of the construction of a five-story flour and grain warehouse built in this city under my supervision when architect for the Pennsylvania R. R. Co. The load per square foot, including weight of construction, runs as high as three hundred pounds. Yours truly,

W. BLEDDYN POWELL.

NOTES & CLIPPINGS

Artists' Colors. — From the cochineal insect is obtained the gorgeous carmine, as well as the crimson, scarlet, and purple lakes. Sepia is the inky fluid discharged by the cuttle-fish to render the water opaque for its own concealment when attacked. Indian yellow is from the urine of the camel. Ivory black and bone black are made out of ivory chips. The exquisite Prussian blue is got by fusing horses' hoofs and other refuse animal matter with impure potassium carbonate. It was discovered by an accident. In the vegetable kingdom are included the lakes, derived from roots, barks, and gums. Blue black is from the charcoal of the vine stalk. Lamp black is soot from certain resinous substances. From the madder plant, which grows in Hindustan, is manufactured Turkey red. Gamboge comes from the yellow sap of a tree, which the natives of Siam catch in cocoanut shells. Raw sienna is the natural earth from the neighborhood of Sienna, Italy. When burned it is burned sienna. Raw umber is an earth from Umbria, and is also burned. To these vegetable pigments may probably be added Indian ink, which is said to be made from burnt camphor The Chinese, who alone can produce it, will not reveal the secret of its composition. Mastic — the base of the varnish so called — is from the gum of the mastic tree, indigenous to the Grecian archipelago. Bistre is the soot of wood ashes. Of real ultramarine but little is found in the market. It is obtained from the precious lapis lazuli, and commands a fabulous price. Chinese white is zinc. Scarlet is iodide of mercury, and cinnabar, or native vermilion, is from quicksilver ore. — *New Orleans Picayune.*

The World's Big Waterfalls. — According to Dr. Wertsch, the highest waterfalls are the three Krimbs Falls, in the upper Prinzgau, which have a total height of 1148 feet. The three falls next in height are found in Scandinavia — the Verme Foss, in Romsdal, 984 feet; the Vettis Foss, on the Sogne Fjord, 853 feet; the Rjuken Foss, in Thelemarken, 804 feet. With a decrease in height of 213 feet, the three Velino Falls, 591 feet, near Zerni, the birthplace of the historian Tacitus, follow next and are succeeded by the three Tessa Falls, in the Val Formazza, 541 feet. The Gastein Falls, in the Gastein Valley, 469 feet, are midway between the Skjaggedal Foss, in the Hardanger Fjord, 424 feet, and the Boring Foss, in the same fjord. The great Anio Cascade near Tivòli, 315 feet, appears small by the side of the foregoing, but is still larger than the Falls of the Elbe in the Riesengebirge, which are only 148 feet high. If the width of the falls is taken into consideration, the most imposing are those of the Victoria Falls of the Zambesi, which are 394 feet high by a width of 8,200 feet. A long way behind come the Niagara Falls, 177 feet high and 1,968 feet wide. The third largest fall is that of the Rhine at Schaffhausen, 148 feet wide, by only 33 feet high. The highest waterfalls mentioned cannot compare with those gigantic falls as regards cubic contents. — *Iron.*

The Elevator for the Eiffel Tower. — A curious elevator has been proposed for use in the Eiffel tower, which it is proposed to erect in Paris for the next exhibition. The tower is to be 984 feet high, and none of the ordinary forms of elevators could be used with safety. The plan proposed is to construct in the interior of a cylindrical tower a spiral railway track, on which shall run a truck occupying the whole interior space. This circular truck carries a double-decked car which is raised by the latter's revolution. Motion is communicated to the truck by an endless cable driven by a stationary engine. This cable passes through the car and runs over a series of friction-pulleys, which communicate their motion to the trucks through a worm-gear and spur-wheel. The weight of the elevator-car is supported by the wheels of the truck, and these are only to be revolved by the worm-gear. Consequently, if anything should happen to the cable, the car would not descend, but would remain stationary until the persons in the car started the gear, and would then only descend as long as motion continued to be given to it. The cable is run at a high speed, which the gear reduces, and thus it is possible to use quite a small cable to give motion to a car containing two hundred people. — *Iron.*

Compound for Patching Stone. — The restoration of some of the most important stone structures in Paris, such as the colonnade of the Louvre, of the Pont Neuf, and of the Conservatoire des Arts of Metiers, has been mainly accomplished by means of a metallic cement invented by Professor Brune. It consists of a powder and a liquid, the first composed of two parts by weight of oxide of zinc, two of crushed limestone of a hard nature, and one of crushed grit, the whole intimately mixed and ground, ochre in suitable proportions being added as a coloring matter. The liquid employed consists of a saturated solution of zinc in commercial hydrochloric acid, to which is added a part by weight of hydrochlorate of ammonia, equal to one-sixth that of the dissolved zinc, and this liquid is diluted with two-thirds of its bulk of water. In using the cement, one pound of the powder is mixed with two and a half pints of the liquid. The cement hardens very quickly and is of great strength. — *Exchange.*

The Canadian Parcels-Post. — As there appears to be an impression that the new parcels-post to be established on the 1st of February between Canada and the United States is to be confined to correspondence, books, etc., it may be as well to state that it is to include merchandise. The maximum weight will be five pounds, and the rate 12 1-2 cents per pound. — *Montreal Witness.*

Munich International Art Exhibition. — This Exhibition will be held in the Royal Crystal Palace at Munich. It will be opened on the 1st of June, 1888, and will continue open until the end of October. Works of art of all countries in the departments of painting, sculpture, architecture, drawing, and reproduction are admitted. Works of art-industry, if they are entitled by artistic invention and execution to be considered as works of art, will also be admitted, but only on the special invitation of the Central Committee, or by the Collective Commissioners. The Central Committee defray the expenses of transport of all works of art approved by a jury of admission. All applications must be received by the Central Committee (Luitpoldstrasse, Nr. 3, München) by the 15th of March next, but no work of art must arrive at Munich before the 1st of April.

An Apprentice cannot join a Union. — In the County Courts today Judge Baily gave a boy apprentice in a glass factory one week in which to return to work or suffer sentence. The boy's defence was that he supposed he was discharged because he had joined a labor union, which had entered upon a strike. Judge Baily decides that an apprentice cannot join a union.

TRADE SURVEYS

In the six cities of New York, Philadelphia, Chicago, St. Louis, Kansas City and St. Paul, the estimated increase in this year's building operations over the past, and it is largely guess-work, is put at between twenty and twenty-five million dollars. In three of the Western cities, architects and builders have received instructions to push work a little sooner than usual. Manufacturers of building material in several Western cities have already secured contracts for material and supplies to be furnished during the coming spring and summer. Several railroad companies have also bought liberally of lumber, brick, stone and other material to be used in the construction of work agreed upon. These are favorable indications, and they certainly point to an active resumption of work in the spring. All that has been said in the trade and financial columns of daily and weekly papers has not as yet intimidated promoters of new railway or industrial enterprises. A great deal of money is being offered in Eastern financial centres, and, even were enterprise halting, it would be stimulated by the liberality of money-lenders, especially in real estate and land schemes, which seem to be multiplying of late rather than declining. There is an abundance of money available for Western borrowing farmers and Southern borrowing planters. Builders who have important house-building schemes in hand are encouraged by local capital throughout the West and in some parts of the South. During the month of December, a great many requirements were made out by railroads, manufacturers and buyers of material of one kind or another, and these requirements will take the shape of orders this month. There is a slight downward tendency in prices, but it may disappear at any moment. A slight decrease in the volume of business is noted day by day and week by week as against twelve months ago, but this is not regarded as of any moment. The stocks of material for working up in the hands of manufacturers, the stocks of supplies in the hands of railroads, and the stocks in the hands of jobbers and retailers are all lighter than business experience and prudence require, but consumers prefer to run with light stocks chiefly because of the enormous producing capacity of the country and because of the supposed probability of an overcrowding of the channels of production. This is really a very remote danger. A careful study of the entire situation does not warrant the opinion that the country is in danger of an over-supply. A few reasons for this confident belief against an over-supply can be given in a few words. First, the volume of money is sufficient to keep enterprise actively engaged. Railroad expansion, while it has gone a little beyond immediate requirements, is below the requirements of twelve months hence in three-fourths of the territory in the United States. Railroad-builders recognize this fact. Then, a great demand is already springing up for river and lake crafts, a fact which cannot be too strongly dwelt upon. Then, again, the demand for materials and supplies for shop-work, mill-work, factory and foundry work, is a factor which is under-estimated by all excepting the few whose business it is to follow up and solicit work of this character. The machinists, the founders and the manufacturers of the country know better than editors and financial reviewers the real extent and depth of the coming demand for supplies. Bankers are preparing weekly clearing-house exchanges from thirty and forty cities, and weekly and monthly returns from one hundred railroads and more, and are noting the weekly list of commercial failures, and the volume of freight-traffic over the trunk lines, but there are other and more important matters to be looked at in order to have a proper understanding of the real tendencies at work beneath the surface of trade. The country is not really over-producing, and there is not any danger of over-production in sight, yet an apparent over-production may develop itself within ninety days. If it does it will. The merchant-steel workmen are endeavoring to advance wages ten per cent. Bituminous miners in some parts of the West are demanding a recognition of the old basis of wages made at Columbus, O., and the refusal to recognize it may probably result in the suspension of work in several localities. Neither the supply of coal or prices can be affected by any probable action of miners in the West, because of the great increase in the number of mine openings. Several Western railroad companies have within the past four months developed their own sources of supply, and most of the railroad companies west of the Mississippi are now following this policy. The anthracite miners went on strike this week and declare their ability to remain out six months. The production of both anthracite and bituminous coal is, according to present estimates, about eight million tons ahead of 1886. The anthracite miners have been the victims of oppression and injustice beyond the lot of the average workman, and public sentiment in Pennsylvania, where the conditions are understood, and in some other sections, seems to be largely with them. A Wall Street paper is authority for the statement that next year's building operations in New York will reach sixty-five million dollars. Very heavy disbursements this month will help to ease up the money market and possibly improve collections, which for some weeks past have been rather difficult. Brokers and manufacturers expect an improvement in the volume of business during this month, and the conditions of the country seem to fully warrant the expectation. In a general way stocks are light. The textile manufacturers are crowded in the cotton-producing line. Makers of machinery in the New England and Middle States are mostly busy, and about fifteen to twenty per cent of the capacity will work overtime for a few weeks. The iron and steel mills throughout the West resumed full time on Tuesday. Throughout the South that industry continues to be exceptionally prosperous. On some railroads in the West large discharges of men have been made by way of guarding against the anticipated demand for an advance.

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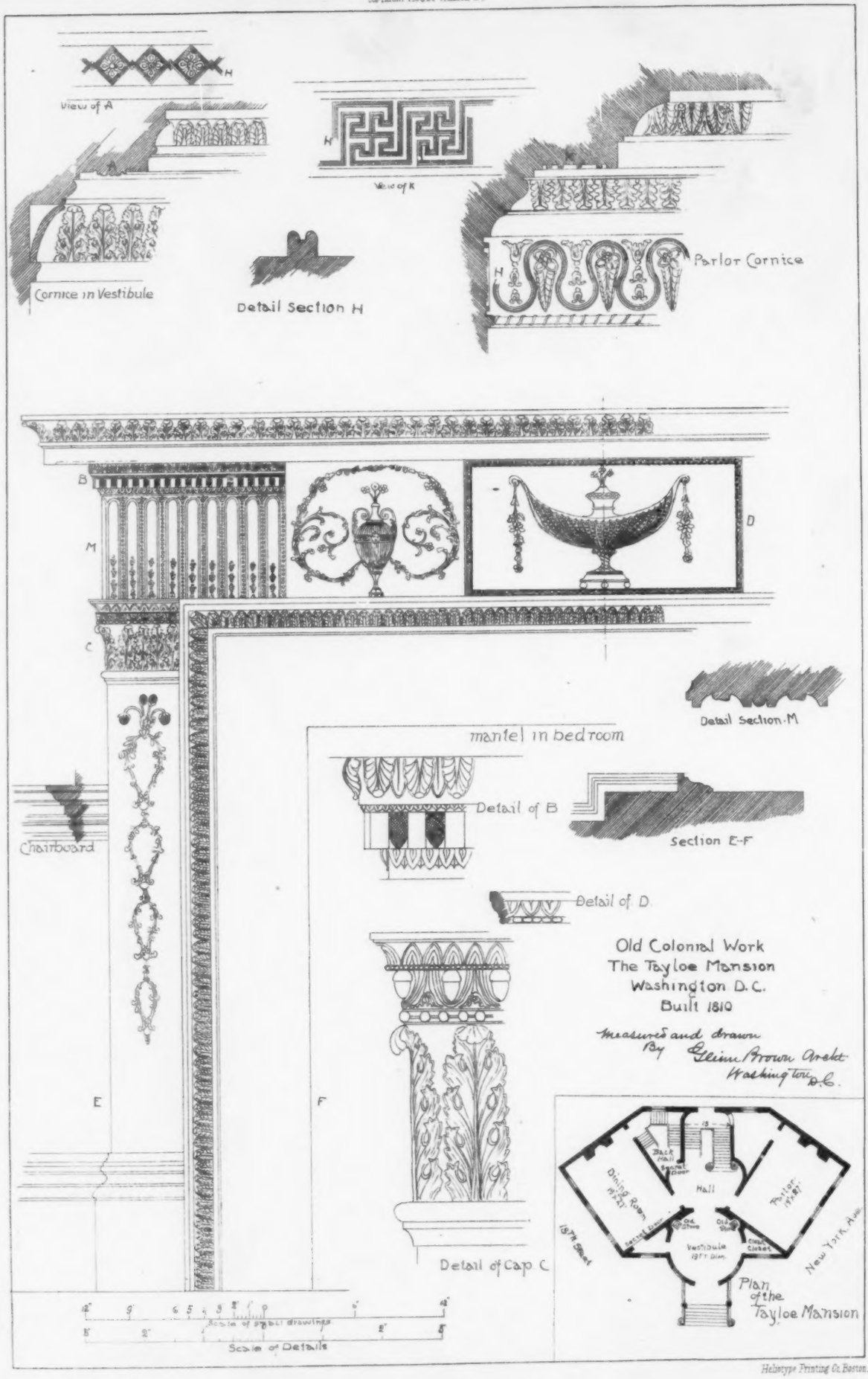

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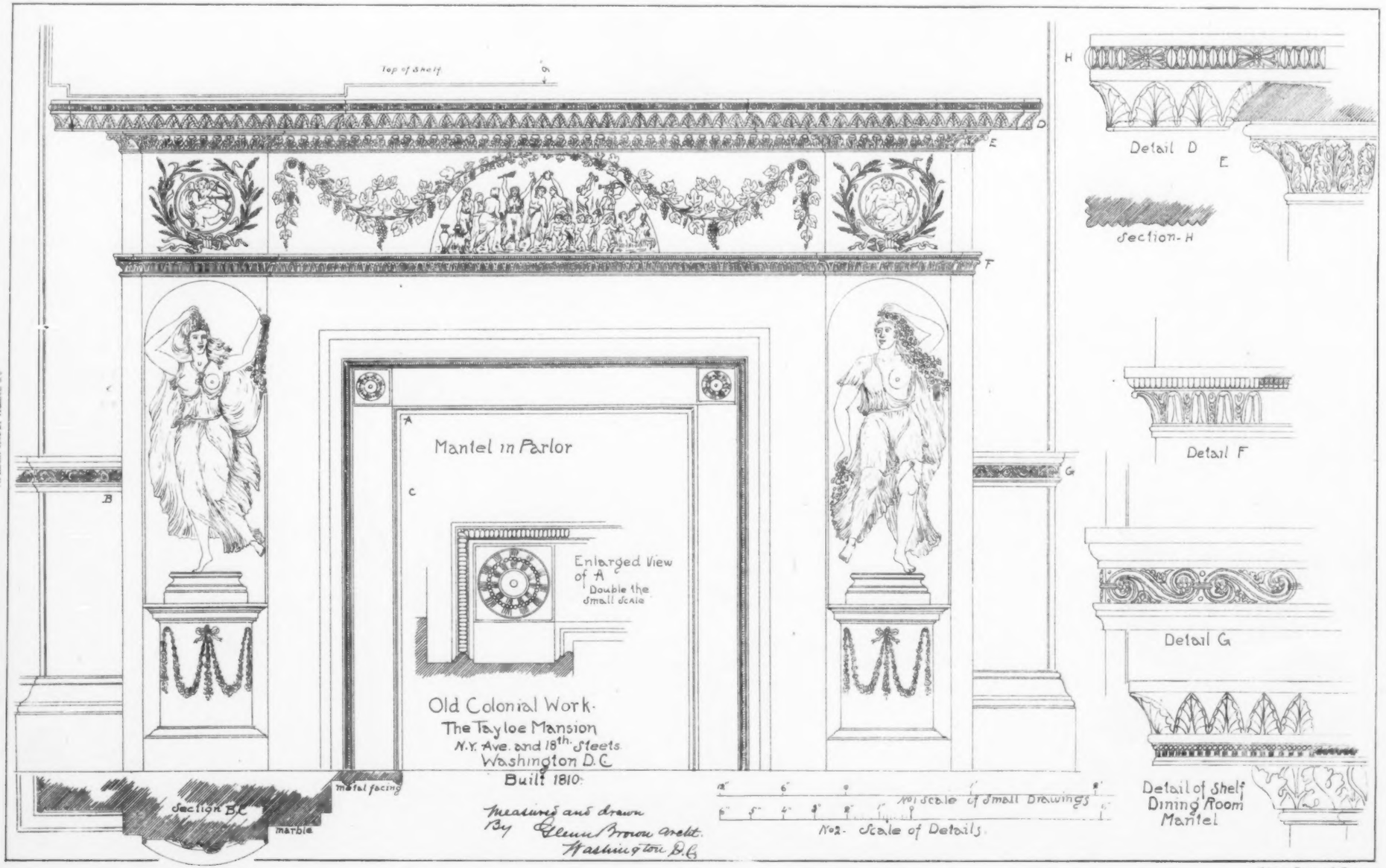

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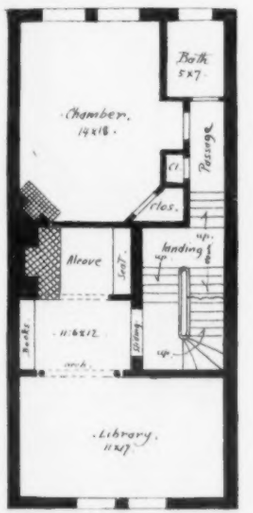
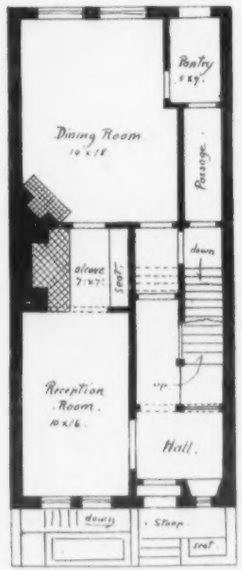
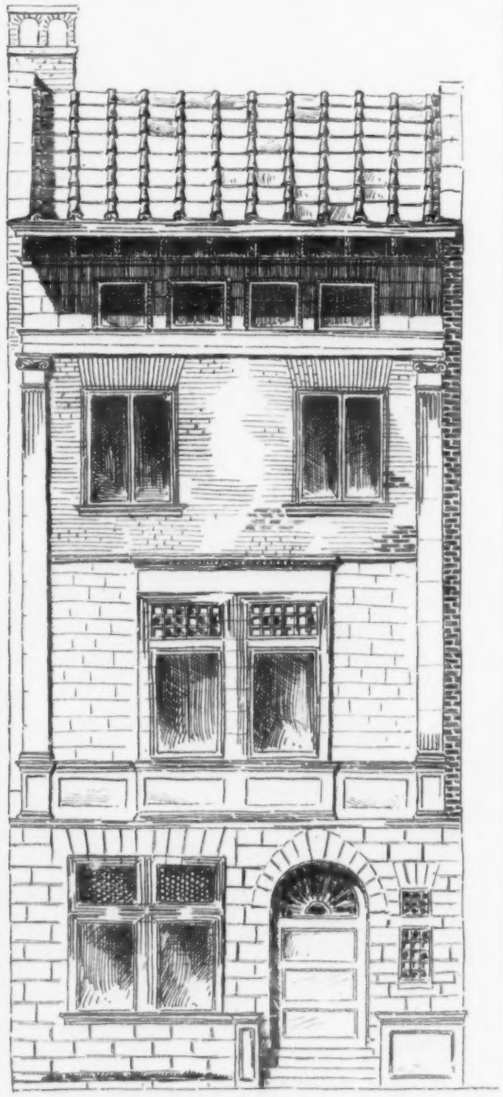




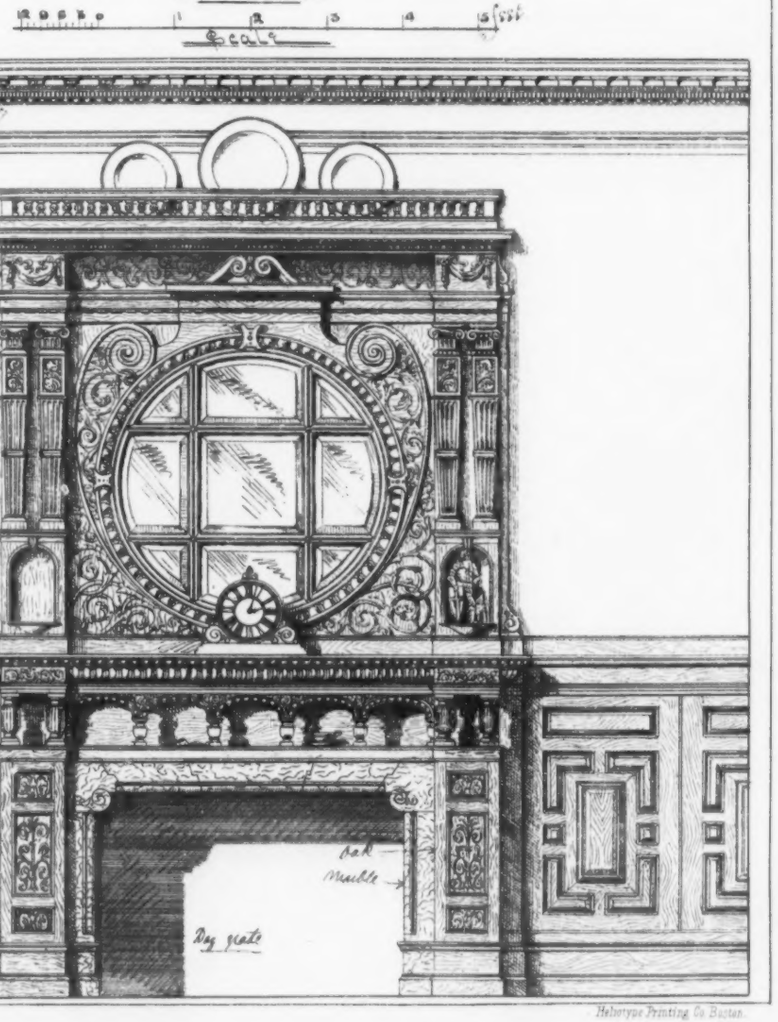


CITY FRONT — E.R. TILTON, ARCHT

MANTLE PIECE

JAMES R. RHIND. ARCHT.

MONTREAL



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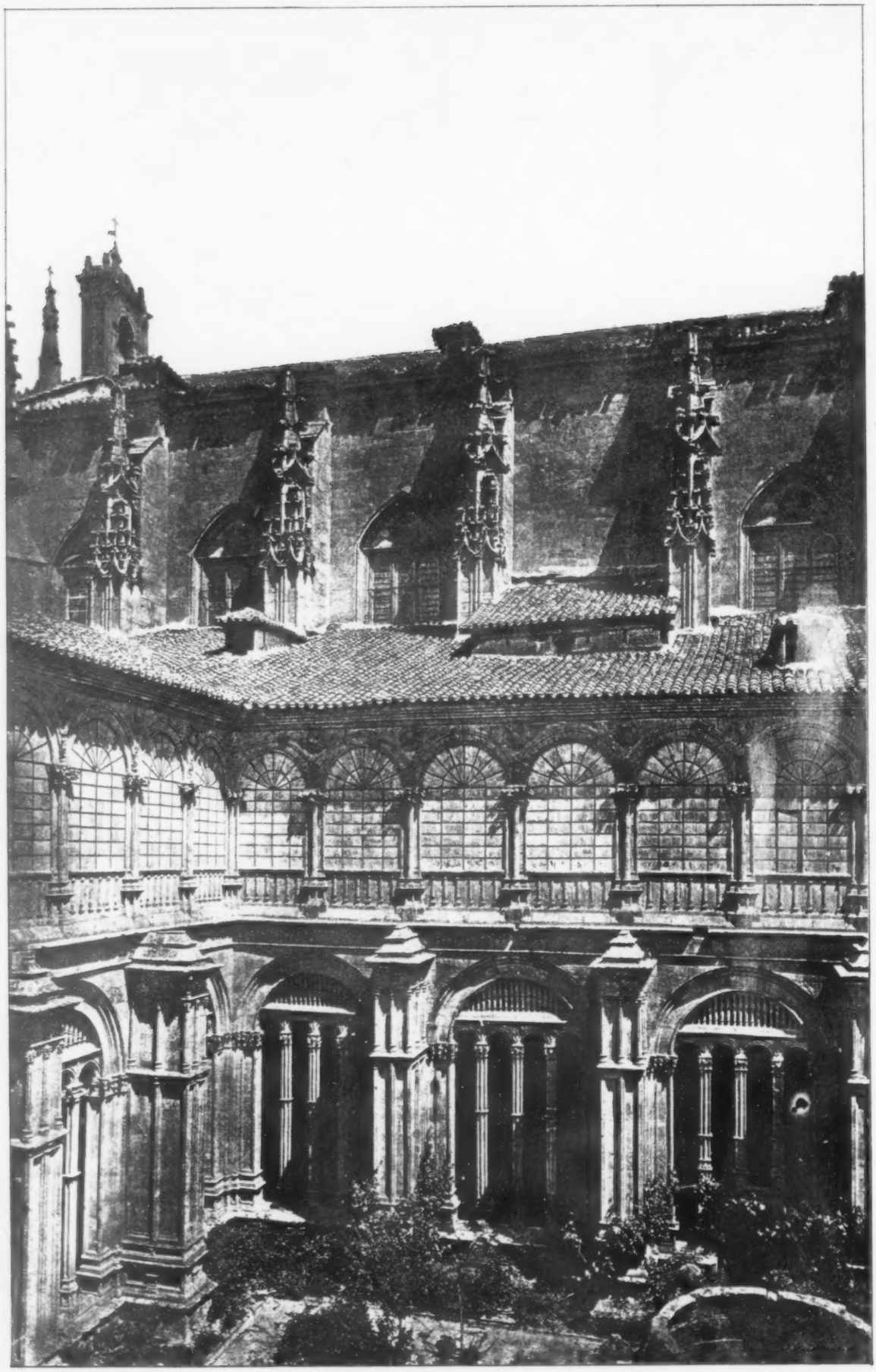

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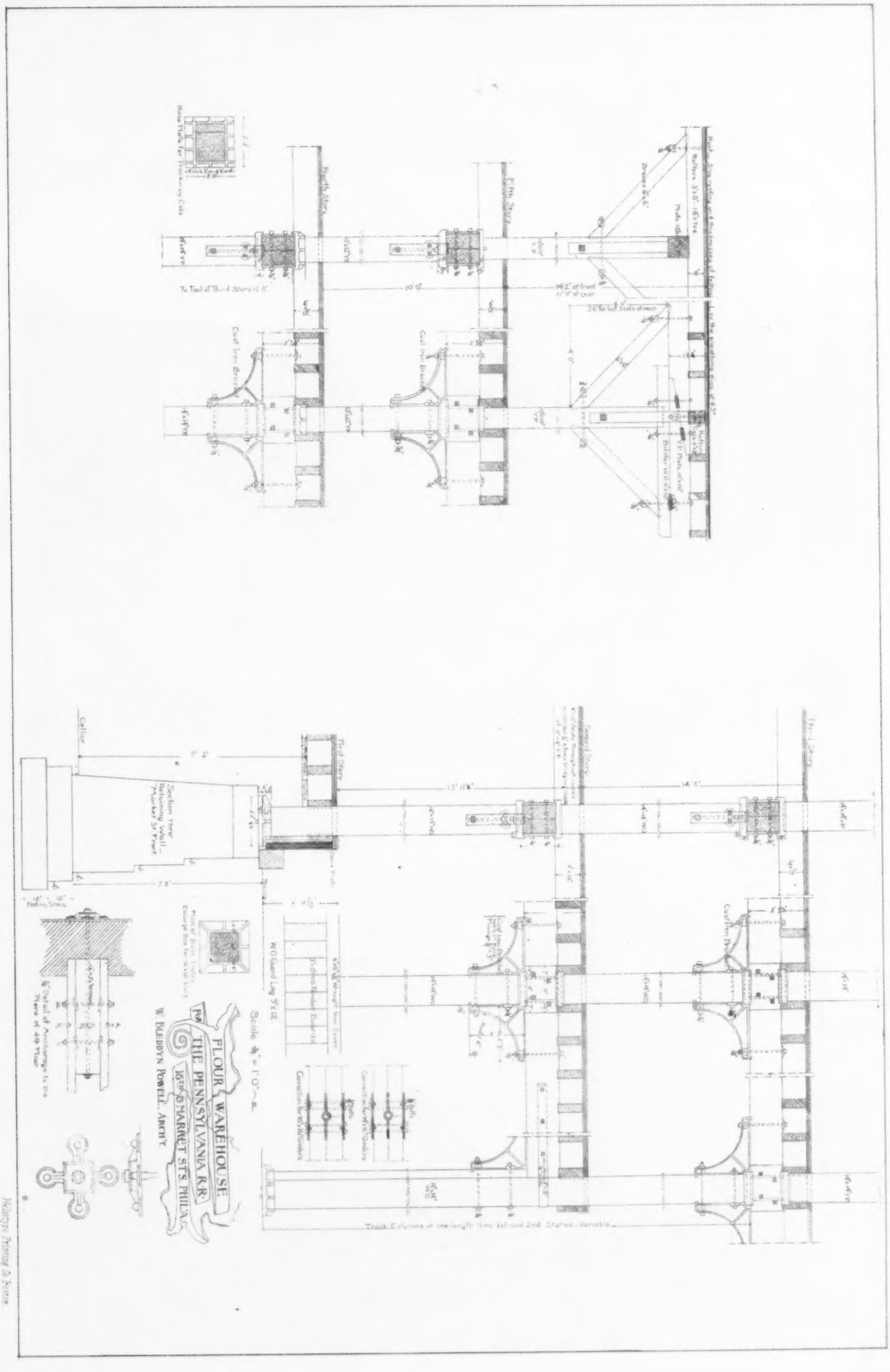
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